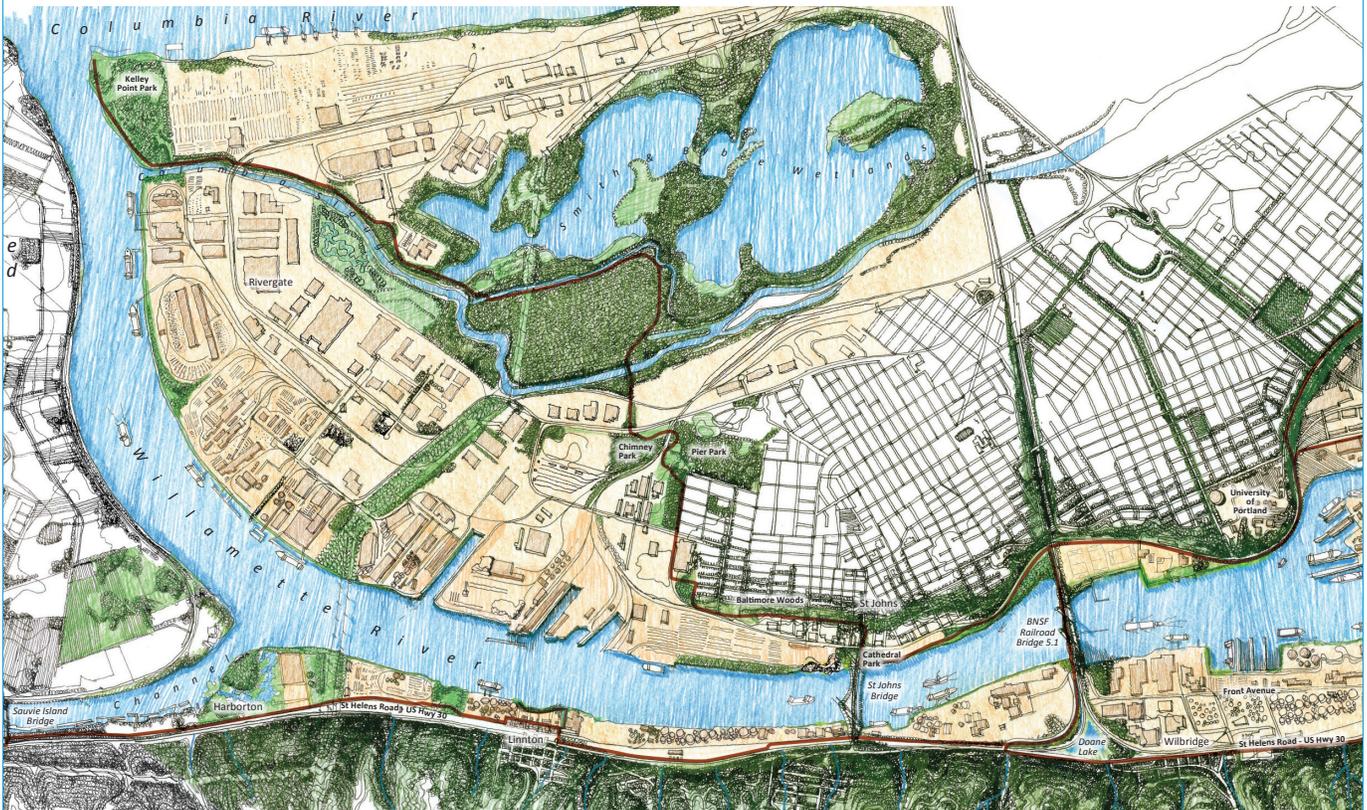


THE RIVER PLAN  
NORTH REACH

RECOMMENDED DRAFT

NOVEMBER 2009



VOLUME 2:  
ECONOMIC PROSPERITY BACKGROUND INFORMATION



City of Portland Bureau of  
**Planning and Sustainability**  
Sam Adams, Mayor | Susan Anderson, Director

# ACKNOWLEDGEMENTS

## **Portland City Council**

Sam Adams, Mayor, Commissioner-in-charge; Nick Fish, Commissioner; Amanda Fritz, Commissioner; Randy Leonard, Commissioner; Dan Saltzman, Commissioner

## **Portland Planning Commission**

Don Hanson, President; Amy Cortese, Vice President; Michelle Rudd; André Baugh; Lai-Lani Ovalles; Howard Shapiro; Jill Sherman; Irma Valdez

## **River Plan Committee**

Don Hanson, Chair; Brian Campbell, Vice Chair (through 8/07); Pauline Anderson; Jason Graf; Bob Naito; Melissa Powers; Greg Wolley; Krystyna Wolniakowski

## **Portland Bureau of Planning and Sustainability**

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David Munro; Darlene Siegel, Tetra Tech

**Special thanks** to the many property owners, community groups, interested individuals, and City bureau and other agency staff who participated in the process, and whose comments have contributed to this document.

# RIVER PLAN / NORTH REACH VOLUMES

## **VOLUME 1A: POLICIES, OBJECTIVES AND RECOMMENDATIONS**

*This volume describes the project background, policy context and recommendations to address Economic Prosperity, Watershed Health, Access, Riverfront Communities, and Working with our Partners. (Available in print)*

## **VOLUME 1B: CODE AMENDMENTS AND ZONING MAPS**

*This volume contains amendments to the comprehensive plan, zoning code, and other City titles, and zoning maps. (Available in print)*

## **VOLUME 2: ECONOMIC PROSPERITY BACKGROUND INFORMATION**

*This volume includes background information for some of the economic prosperity recommendations. For additional information please see the River Plan website. (Available on CD)*

## **VOLUME 3A: NATURAL RESOURCES INVENTORY: RIPARIAN CORRIDORS AND WILDLIFE HABITAT**

*This volume contains natural resource information for 13 resource sites in the North Reach. (Available on CD)*

## **VOLUME 3B: NATURAL RESOURCES INVENTORY: RIPARIAN CORRIDORS AND WILDLIFE HABITAT—APPENDICES**

*This volume contains five technical appendices to the Willamette River Natural Resource Inventory including a description of the methodology used to develop the inventory. (Available on CD)*

## **VOLUME 3C: ECONOMIC, SOCIAL, ENVIRONMENTAL AND ENERGY ANALYSIS AND RECOMMENDATIONS FOR RIPARIAN CORRIDORS AND WILDLIFE HABITAT**

*This volume contains a State Land Use Planning Goal 5 required analysis of the tradeoffs associated with different levels of natural resource protection for the upland portions of the River Plan / North Reach planning area. (Available on CD)*

## **VOLUME 4: ACCESS BACKGROUND INFORMATION**

*This volume includes background information for the access related recommendations. For additional information please see the River Plan website. (Available on CD)*

## **VOLUME 5: ORDINANCE AND RESOLUTION**

*This volume includes the draft River Plan/ North Reach Ordinance and Resolution. (Available in print)*

*Documents listed as available on CD can be ordered in print form. Please allow seven days for printing.*

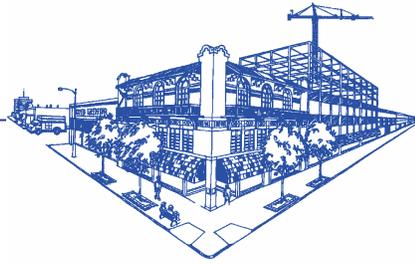
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# E. D. Hovee & Company, LLC

Economic and Development Services



## MEMORANDUM

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To: Sallie Edmunds, Diane Hale, Portland Bureau of Planning and Sustainability  
From: Tess Jordan, Eric Hovee  
Subject: River Overlay Zone Development Projection  
Date: February 12, 2009

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This memo estimates development over a 20 year time period on sites within the proposed Willamette River overlay zones (river industrial, river recreation and river general). These zones apply to riverfront sites extending from approximately the Broadway Bridge (to the south) north to the Columbia River, and incorporate land on both the east and west banks of the Willamette River.

Development is ultimately profiled as a dollar amount, for the purposes of estimating maximum revenue potential from a fee in lieu tied to the cost to improve the condition of the river bank for fish and wildlife habitat.

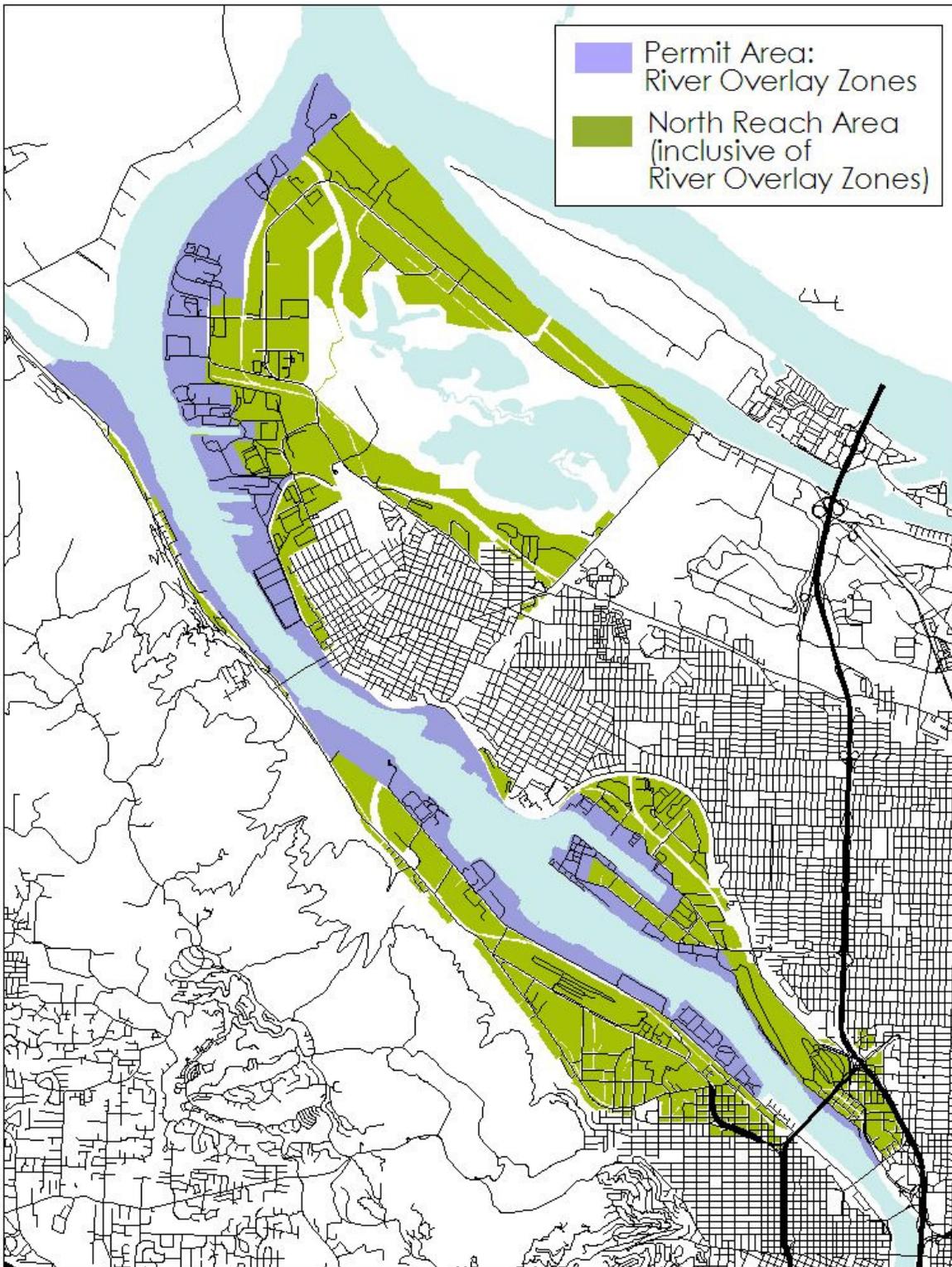
Three elements were considered in this projection:

1. The history of investment within the Willamette River North Reach, as reflected by building permits;
2. Employment forecasts for Portland's industrial sectors; and
3. Land availability and development capacity within the relatively limited set of waterfront parcels with which this memo is concerned.

### Realized Investment Trends: Permit Data

Recent permit-generating investment within river overlay properties has averaged approximately \$17.7 million per year, according to permit data from 2000 to 2007. This figure includes investments that required building, zoning and site development permits. Rather than describing total investment (which would include equipment and machinery), it describes only that portion for which permits were required (which is the portion relevant to this projection as the basis for a potential revenue source).

**Figure 1. River Geographies**



Source: City of Portland Bureau of Planning, Metro's RLIS, E.D. Hovee & Company, LLC.

**Figure 2. Investment Value Associated with Permits Obtained within the Proposed River Overlay Zones Area**

<b>Year</b>	<b>New Square Footage</b>	<b>Building Improvements</b>	<b>Demolition</b>	<b>Temporary Structures</b>	<b>Exterior &amp; Site Work*</b>	<b>Total</b>	<b>New Square Feet Built</b>
2000	\$3,992,000	\$1,196,000	\$0	\$10,000	\$1,124,000	\$6,322,000	66,400
2001	\$705,000	\$1,264,000	\$373,000	\$1,728,000	\$3,737,000	\$7,807,000	25,700
2002	\$1,504,000	\$486,000	\$48,000	\$4,000	\$1,186,000	\$3,228,000	100
2003	\$15,349,000	\$487,000	\$129,000	\$10,000	\$9,272,000	\$25,247,000	147,200
2004	\$424,000	\$2,645,000	\$1,370,000	\$0	\$3,917,000	\$8,356,000	4,800
2005	\$32,587,000	\$1,449,000	\$108,000	\$0	\$2,725,000	\$36,869,000	399,000
2006	\$12,023,000	\$577,000	\$103,000	\$0	\$9,555,000	\$22,258,000	273,700
2007	\$13,550,000	\$2,430,000	\$415,000	\$0	\$14,835,000	\$31,230,000	44,000
<b>Total</b>	<b>\$80,134,000</b>	<b>\$10,534,000</b>	<b>\$2,546,000</b>	<b>\$1,752,000</b>	<b>\$46,351,000</b>	<b>\$141,317,000</b>	<b>960,900</b>
2000-2007 Average	\$10,017,000	\$1,317,000	\$318,000	\$219,000	\$5,794,000	\$17,665,000	120,000
Firms with Permits	30	32	15	5	54	80	
Avg Value per Firm (over 7 years)	\$2,671,000	\$329,000	\$170,000	\$350,000	\$858,000	\$1,766,000	-
Percent of Total Value	57%	7%	2%	1%	33%	100%	

Note: Exterior & Site Work includes mitigation, landscaping, removing/replacing pilings (in-water), stormwater management, pads, paving, foundations, etc.

Source: Portland Planning Bureau; E.D. Hovee & Company, LLC

In contrast, Bureau of Planning, Portland Development Commission and Port of Portland staff estimated annual average total investment of \$110 million between 2004 and 2007, a significantly larger figure that includes industrial equipment and the total value of expansion, modernization and maintenance of properties.

Permit-associated investment shown on Figure 2, has been classified by type, to distinguish building and site improvements associated with on-going tenancy from new building development (either by existing or new tenants/property owners).

Distinguishing revenue in this way illustrates that an annual average of \$10 million in investment derives from *new building construction*, or 57% of the total average annual investment. The remainder 43% (\$7.6 million annually) appears to be primarily associated with *on-going improvement and maintenance* of existing site users' capital investments. One concern with projecting past trends forward is whether past investment is associated with the kinds of businesses that the City wishes to encourage on its industrial waterfront sites. Many sites are currently reserved for river-dependent uses, which has narrowed the pool of potential site users. A broadening of this pool has been suggested by also allowing rail-dependent uses within harbor industrial sites in the future. This suggests that investments experienced over the last seven years may be lower than in the future due to the expanded kinds of projects that would be permissible under new City policy.

A review of the types of firms that applied for permits between 2000 and 2007 indicates that over 97% have had a long-time presence in the harbor's industrial district. Regional and City economic policy seeks to support and encourage these firms. The remaining firms that made investments were unfamiliar, but may well have significant history in the area. This lack of new (vs. established) business investment may be indicative of challenges that new firms or industries encounter finding acceptable waterfront sites on which to locate, especially given brownfield, floodplain, infrastructure and other limitations associated with Portland waterfront development.

Looking forward, we anticipate that the annual average of \$7.6 million associated with on-going property upgrades and maintenance will continue into the future, albeit with year-to-year variations depending on economic conditions and the "lumpiness" of some of the major capital investments represented. New investment, in contrast, will respond to both larger growth trends in the industrial sectors and to land availability within the specific set of waterfront sites under consideration.

## **Industrial Employment Outlook**

An employment forecast was prepared for all industrial areas within the River Plan/North Reach study area in 2006 as part of the Planning Bureau's Working Harbor Reinvestment Strategy (WHRS). Consistent with Metro regional forecasts, the WHRS allocation projected 14,407 net new jobs within the Swan Island, Northwest and Rivergate industrial areas over the 25 years between 2005 and 2030. This forecast covered both waterfront and upland (non-waterfront) properties.

An equivalent growth rate over a shortened 20 year time period equates to 11,526 jobs (based on uniform annual job growth). Total land needs associated with this job growth were estimated at 877 acres, or 702 acres when adjusted for the shorter 20 year timeframe.

As mentioned above, the working harbor forecast is not specific to waterfront sites. We therefore consider land available to accommodate this forecast within the River Plan/North Reach study area.

## North Reach Waterfront Sites Land Supply & Development Capacity

There are approximately 173 vacant acres within the River Plan/North Reach study area with no known development constraints. These acres are entirely unoccupied, with no known floodplain or contamination issues, according to a land inventory updated by the Bureau of Planning in January 2009. This includes all parcels over 0.1 acres in size. These sites are considered easy to develop, but none are within the river overlay area; all are upland sites.

An additional 182 acres are within parcels that are partially occupied; these sites have some development but also land available for expansion, most likely by an existing business. Fifty-four of these acres are on waterfront sites. These sites are also considered easy to develop, although their availability may be limited to those businesses with excess land.

Together, these categories of vacant (unconstrained) land account for 355 acres, about 350 acres short of the 702 acres necessary to accommodate projected employment growth.

In addition to these 355 vacant acres, there are 466 additional acres within the larger North Reach geography with known impediments to development such as location within the floodplain or proposed environmental protection zone (partly buildable sites), or some level of contamination (brownfield sites). Some portion, although not all, of this constrained vacant land is expected to develop as well (as described below). Even if all develops—a scenario considered unlikely due to the significant barriers to development on some parcels—vacant land within the North Reach falls short of what is necessary to accommodate job growth. This check on land availability within the larger River Plan/North Reach geography indicates a land constrained environment, from which we conclude that sites within the river overlay zones should develop within this forecast period (20 years) so long as the cost of development is not prohibitive.

Anticipated development within the river overlay zones is outlined in detail below, as development on these sites is the focus for a possible future revenue stream. Sites are categorized by size and characteristics (brownfield, partly buildable, partly occupied and unoccupied, described below). Assumptions were developed on the likelihood and timeframe for development of land within each category based on market observations for two scenarios, conservative and aggressive. The following bullet points describe each of the categories of vacant land and outline assumptions regarding their development over a 20 year timeframe. Detailed assumptions are outlined in Appendix A.

- **Brownfield:** Sites with contamination issues identified by Oregon DEQ (not categorized in terms of expense, severity, etc). These sites are entirely unoccupied. Thirteen sites fall within this category. Vacant brownfields are unlikely to attract investment by new firms

until existing liability issues including Superfund uncertainty is more fully resolved. In the conservative scenario, only 30% of these sites develop. In an aggressive scenario, public investment is assumed to spur reinvestment of the two to three sites larger than 10 acres that remain undeveloped in the conservative scenario.

- **Partly Buildable:** This category includes vacant portions of parcels within the flood plain, proposed conservation and river environmental zones. Development within the floodplain will require balanced cut & fill. Site size describes only the portion of the site that is within the floodplain, however, many of these partly buildable lands are portions of larger taxlots on which there is existing investment. As would be expected, the majority of these sites within the North Reach fall within the river overlay zones. We assume that only sites with some upland acreage will be developed. These parcels may also be affected by in-water Superfund liability issues. In the conservative scenario, only 35% of this land develops, increasing to 55% in the aggressive scenario. No sites less than one acre are projected to develop in either scenario.
- **Partly Occupied:** Excess land that is not developed but is within the same parcel as a viable business. Parcel size describes unoccupied portion only. We assume that investment on these parcels represents existing businesses expanding on-site. These vacant portions of parcels are considered very likely to develop, as permit data indicates that almost the entirety of investment realized 2000-2007 was by businesses with long histories in the harbor industrial area. There are 26 pieces of land within this category; nine are over one acre in size. All land develops in both scenarios, but more rapidly in the aggressive scenario.
- **Unoccupied:** No known constraints to development. This category is considered very likely to develop, but no sites within the River Overlay zones fall within this category.

**Figure 3. Assumptions for Development, North Reach Riverfront Parcels**

		Parcels by Size (Acres)				
		0.1 - 1	1 - 5	5 - 10	10 - 20	20+
<b>Supply</b>						
	Brownfield	6	3	1	2	2
	Partly Buildable	24	23	6	2	3
	Partly Occupied	17	5	3	1	0
	Unoccupied	0	0	0	0	0
<b>Conservative Timeline for Development by parcel size</b>						
	Brownfield	30% equally spread years 5-20 (only owner-occupied)				
	Partly Buildable	None	35% equally spread years 5-20			
	Partly Occupied	25% years 5-20	All develop years 5-15			No parcels
<b>Aggressive Timeline for Development by parcel size</b>						
	Brownfield	30% equally spread over years 5-20		All remaining parcels years 10-20		
	Partly Buildable	None	55% equally spread years 5-20			
	Partly Occupied	40% years 5-20	All develop years 5-10			No parcels

Source: Bureau of Planning, Working Harbor: Vacant Land & Brownfields map & shapefiles updated January 26, 2009; E.D. Hovee & Company, LLC.

With both the conservative and aggressive scenarios, it is noted that no new investment is anticipated in years 0-5 (2009-2013). This is due to the nation's current recession with further business slowdown and reduced employment yet to come.

The result of these assumptions is a tally of acreage expected to develop. Uniform assumptions concerning industrial sites' floor area ratios and building value per square feet were applied to estimate the value of future (permit-related) investment on these properties. Appendix A includes tables that detail building square footage and the value of investment for 5-year increments, under both the conservative and aggressive scenarios, by parcel size and land characteristics (brownfield, partly buildable, partly occupied and unoccupied).

## Conclusions: Revenue Potential

The development capacity of vacant waterfront sites equates to \$278 million of *new development* over 20 years in a conservative scenario and \$543 million over 20 years in an aggressive scenario. This dollar estimate derives from assumptions concerning the extent and nature of new development, detailed in the appendix. When combined with *reinvestment* in existing facilities (based on annual trends) the combined investment totals range from \$431-\$696 million over 20 years. Annually, this averages \$21.6 and \$34.8 million per year, although revenue for the first five years of the forecast (2009-2013) is significantly lower than in later years (see table below). This range encompasses a low of 22% above the annual investment trends over the past seven years (the conservative estimate) and a high of about 97% above those historic trends (the aggressive estimate). Both scenarios reflect development of land that has been largely passed by over the past 10-15 years, due to either contamination, environmental restrictions or land held for future expansion.

**Figure 4. Waterfront Sites Investment Forecast, 5 Year Increments**

	2009-2013 Year 1-5	2014-2018 Year 5-10	2019-2023 Year 10-15	2024-2028 Year 15-20	Annual Average	20 Year Total
<b>Conservative</b>						
New Development	0	\$92,828,000	\$92,828,000	\$92,828,000	\$13,924,200	\$278,484,000
Reinvestment	\$38,240,000	\$38,240,000	\$38,240,000	\$38,240,000	\$7,648,000	\$152,960,000
<b>Total</b>	<b>\$38,240,000</b>	<b>\$131,068,000</b>	<b>\$131,068,000</b>	<b>\$131,068,000</b>	<b>\$21,572,200</b>	<b>\$431,444,000</b>
<b>Aggressive</b>						
New Development	0	\$196,456,000	\$196,456,000	\$150,151,000	\$27,153,000	\$543,063,000
Reinvestment	\$38,240,000	\$38,240,000	\$38,240,000	\$38,240,000	\$7,648,000	\$152,960,000
<b>Total</b>	<b>\$38,240,000</b>	<b>\$234,696,000</b>	<b>\$234,696,000</b>	<b>\$188,391,000</b>	<b>\$34,801,150</b>	<b>\$696,023,000</b>
<b>Historic Comparison</b>						
New Development					\$10,017,000	
Reinvestment					\$7,648,000	
<b>Total</b>					<b>\$17,665,000</b>	

Source: E.D. Hovee & Company, LLC, Portland Bureau of Planning.

In both the conservative and aggressive scenarios, development activity peaks in years 5 through 15, reflecting recovery from the current recession, time to resolve some of the liability issues associated with contaminated sites identified as high priorities for redevelopment, and the near-

term absorption of the area's easiest sites to develop. The aggressive scenario reflects rates of new construction well above those experienced in recent years. This scenario is best supported by emerging trends for renewed interest in waterfront sites from a greater range of uses (including alternative energy related development), increased scarcity of remaining waterfront sites calling for somewhat greater intensity of development, and ability to resolve brownfield/Superfund issues encouraging investment from new as well as existing firms.

# APPENDIX A. DETAILED TABLES

## Building Square Feet

Uniform Site FAR: 0.3

	0.1 - 1	1 - 5	5 - 10	10 - 20	20+	TOTAL	
<b>AVERAGE SIZE:</b>	0.6	3.0	7.5	15.0	35.9		
<b>Conservative Building SF</b>							
<b>Year 5-10</b>							% to redev
Brownfield	4,300	11,800	9,800	39,200	93,900	159,000	30%
Partly Buildable	0	105,200	68,600	45,700	164,400	383,900	35%
Partly Occupied	10,200	65,300	98,000	65,300	-	238,800	25%
<b>Total</b>	<b>14,500</b>	<b>182,300</b>	<b>176,400</b>	<b>150,200</b>	<b>258,300</b>	<b>781,700</b>	
<b>Year 10-15</b>							
Brownfield	4,300	11,800	9,800	39,200	93,900	159,000	30%
Partly Buildable	0	105,200	68,600	45,700	164,400	383,900	35%
Partly Occupied	10,200	65,300	98,000	65,300	-	238,800	25%
<b>Total</b>	<b>14,500</b>	<b>182,300</b>	<b>176,400</b>	<b>150,200</b>	<b>258,300</b>	<b>781,700</b>	
<b>Year 15-20</b>							
Brownfield	4,300	11,800	9,800	39,200	93,900	159,000	30%
Partly Buildable	0	105,200	68,600	45,700	164,400	383,900	35%
Partly Occupied	10,200	65,300	98,000	65,300	-	238,800	25%
<b>Total</b>	<b>14,500</b>	<b>182,300</b>	<b>176,400</b>	<b>150,200</b>	<b>258,300</b>	<b>781,700</b>	
<b>Aggressive Building SF</b>							
<b>Year 5-10</b>							% to redev
Brownfield	4,300	11,800	32,700	130,700	313,100	492,600	30%
Partly Buildable	0	165,300	107,800	71,900	258,300	603,300	55%
Partly Occupied	16,300	98,000	147,000	98,000	-	359,300	40%
<b>Total</b>	<b>20,600</b>	<b>275,100</b>	<b>287,500</b>	<b>300,600</b>	<b>571,400</b>	<b>1,455,200</b>	
<b>Year 10-15</b>							
Brownfield	4,300	11,800	32,700	130,700	313,100	492,600	30%
Partly Buildable	0	165,300	107,800	71,900	258,300	603,300	55%
Partly Occupied	16,300	98,000	147,000	98,000	-	359,300	40%
<b>Total</b>	<b>20,600</b>	<b>275,100</b>	<b>287,500</b>	<b>300,600</b>	<b>571,400</b>	<b>1,455,200</b>	
<b>Year 15-20</b>							
Brownfield	4,300	11,800	32,700	130,700	313,100	492,600	30%
Partly Buildable	0	165,300	107,800	71,900	258,300	603,300	55%
Partly Occupied	16,300	0	0	0	0	16,300	40%
<b>Total</b>	<b>20,600</b>	<b>177,100</b>	<b>140,500</b>	<b>202,600</b>	<b>571,400</b>	<b>1,112,200</b>	

## Value of Development (real property only)

	0.1 - 1	1 - 5	5 - 10	10 - 20	20+	TOTAL
<b>Value of Improvements: Conservative Scenario</b>						
Cost per SF	\$95			With soft costs	\$119	
<b>Year 5-10</b>						
Brownfield	\$511,000	\$1,401,000	\$1,164,000	\$4,655,000	\$11,151,000	\$18,882,000
Partly Buildable	\$0	\$12,493,000	\$8,146,000	\$5,427,000	\$19,523,000	\$45,589,000
Partly Occupied	\$1,211,000	\$7,754,000	\$11,638,000	\$7,754,000	\$0	\$28,357,000
<b>Total</b>	<b>\$1,722,000</b>	<b>\$21,648,000</b>	<b>\$20,948,000</b>	<b>\$17,836,000</b>	<b>\$30,674,000</b>	<b>\$92,828,000</b>
<b>Year 10-15</b>						
Brownfield	\$511,000	\$1,401,000	\$1,164,000	\$4,655,000	\$11,151,000	\$18,882,000
Partly Buildable	\$0	\$12,493,000	\$8,146,000	\$5,427,000	\$19,523,000	\$45,589,000
Partly Occupied	\$1,211,000	\$7,754,000	\$11,638,000	\$7,754,000	\$0	\$28,357,000
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Brownfield	\$511,000	\$1,401,000	\$1,164,000	\$4,655,000	\$11,151,000	\$18,882,000
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<b>Total</b>	<b>\$1,722,000</b>	<b>\$21,648,000</b>	<b>\$20,948,000</b>	<b>\$17,836,000</b>	<b>\$30,674,000</b>	<b>\$92,828,000</b>
<b>Value of Improvements: Aggressive Scenario</b>						
Cost per SF	\$108			With soft costs	\$135	
<b>Year 5-10</b>						
Brownfield	\$581,000	\$1,593,000	\$4,415,000	\$17,645,000	\$42,269,000	\$66,503,000
Partly Buildable	\$0	\$22,316,000	\$14,553,000	\$9,707,000	\$34,871,000	\$81,447,000
Partly Occupied	\$2,201,000	\$13,230,000	\$19,845,000	\$13,230,000	\$0	\$48,506,000
<b>Total</b>	<b>\$2,782,000</b>	<b>\$37,139,000</b>	<b>\$38,813,000</b>	<b>\$40,582,000</b>	<b>\$77,140,000</b>	<b>\$196,456,000</b>
<b>Year 10-15</b>						
Brownfield	\$581,000	\$1,593,000	\$4,415,000	\$17,645,000	\$42,269,000	\$66,503,000
Partly Buildable	\$0	\$22,316,000	\$14,553,000	\$9,707,000	\$34,871,000	\$81,447,000
Partly Occupied	\$2,201,000	\$13,230,000	\$19,845,000	\$13,230,000	\$0	\$48,506,000
<b>Total</b>	<b>\$2,782,000</b>	<b>\$37,139,000</b>	<b>\$38,813,000</b>	<b>\$40,582,000</b>	<b>\$77,140,000</b>	<b>\$196,456,000</b>
<b>Year 15-20</b>						
Brownfield	\$581,000	\$1,593,000	\$4,415,000	\$17,645,000	\$42,269,000	\$66,503,000
Partly Buildable	\$0	\$22,316,000	\$14,553,000	\$9,707,000	\$34,871,000	\$81,447,000
Partly Occupied	\$2,201,000	\$0	\$0	\$0	\$0	\$2,201,000
<b>Total</b>	<b>\$2,782,000</b>	<b>\$23,909,000</b>	<b>\$18,968,000</b>	<b>\$27,352,000</b>	<b>\$77,140,000</b>	<b>\$150,151,000</b>
<b>Total conservative</b>	<b>\$5,166,000</b>	<b>\$64,944,000</b>	<b>\$62,844,000</b>	<b>\$53,508,000</b>	<b>\$92,022,000</b>	<b>\$278,484,000</b>
<b>Total aggressive</b>	<b>\$8,346,000</b>	<b>\$98,187,000</b>	<b>\$96,594,000</b>	<b>\$108,516,000</b>	<b>\$231,420,000</b>	<b>\$543,063,000</b>
<b>Average annual conservative</b>		\$13,924,200				
<b>Average annual aggressive</b>		\$27,153,150				



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# **Working Harbor Reinvestment Strategy: Sanitary Sewer and Stormwater Infrastructure Analysis: Draft Report**

Prepared for  
**Portland Bureau of Planning**

August 2007

Prepared by  
**Portland Bureau of Environmental Services**





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# Executive Summary

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## Introduction

The City of Portland Bureau of Environmental Services (BES) analyzed the projected sanitary sewer and stormwater infrastructure needs of three North Portland industrial sub-districts and fifteen potential industrial sites targeted for investment and development under the Working Harbor Reinvestment Strategy as prepared by the City of Portland Planning Bureau.

This report documents the results of that analysis, which included preliminary modeling of future infrastructure capacity deficiencies identified downstream of the industrial sites, an itemization of existing capital improvement plan (CIP) projects pertinent to the sites, identification of additional infrastructure improvements to address capacity constraints downstream of the sites, conceptual-level cost estimates to implement these improvements, and prioritization of the improvements.

## Infrastructure Issues

The existing and planned sanitary, combined, and stormwater sewer systems have sufficient capacity to accommodate the development of the targeted Constraint Opportunity Sites. It is not anticipated that development of these sites will significantly affect the sewer system capacity in the Rivergate, Northwest, and Swan Island Subdistricts. Existing and future sewer capacity issues that do exist downstream of the sites are minimal. They are as follows:

- Shipyard Pump Station is downstream of Site RGID01. Sanitary modeling shows capacity issues in the existing condition, which are worse in the future condition. Flows from Site RGID01 do not cause this capacity deficiency. Development of the site may be affected by these constraints.
- Site NWID05 is located approximately 1,000 feet from the nearest public stormwater system with capacity to convey estimated flows from the site. The public stormwater sewer will have to be extended if stormwater is not handled on-site at this location.
- Site NWID14 is located over a mile away from an existing public sanitary system, which has existing capacity deficiencies. This property will require on-site sewer facilities.

## Planned and Potential Improvements

As part of its ongoing engineering planning process, BES has developed recommended CIP infrastructure improvement projects for the sanitary, combined, and stormwater sewer systems in the study area. Those that have been approved are listed and shown in Figure ES-1. Also shown and listed are the Water Resources Development Act projects slated for the study area.

BES is currently in the process of preparing a System Plan Update that will incorporate the findings of recent hydrologic and hydraulic modeling of the City’s sewer systems and the consequential analyses of potential alternatives to address existing and future system deficiencies. At the end of this engineering planning process it is expected that many of these potential projects will be elevated to the list of approved 5-year CIP projects.

In the interim, for the purpose of addressing the few system deficiencies identified in this Working Harbor Reinvestment Strategy analysis, two other potential projects specifically related to the development of the targeted Constrained Opportunity Sites, were identified. These are listed in Table ES-1 with planning level cost estimates and are shown in Figure ES-1. These potential projects will need to be further evaluated and compared with other alternatives through the engineering planning process before they can be recommended and added to the list of approved 5-year CIP projects.

**TABLE ES - 1 Potential Public Infrastructure Improvements and Planning Level Cost Estimates**

Site	Potential Improvement	Planning Level Capital Cost Estimate*
RGID01	Upsize Shipyard Pump Station	\$2,700,000
NWID05	Extend public stormwater sewer pipeline to be within reach of property	\$360,000

\*These are preliminary order-of-magnitude capital cost estimates with an expected accuracy of +50/-30 percent. These estimates should be refined during the predesign and design phases of the projects.

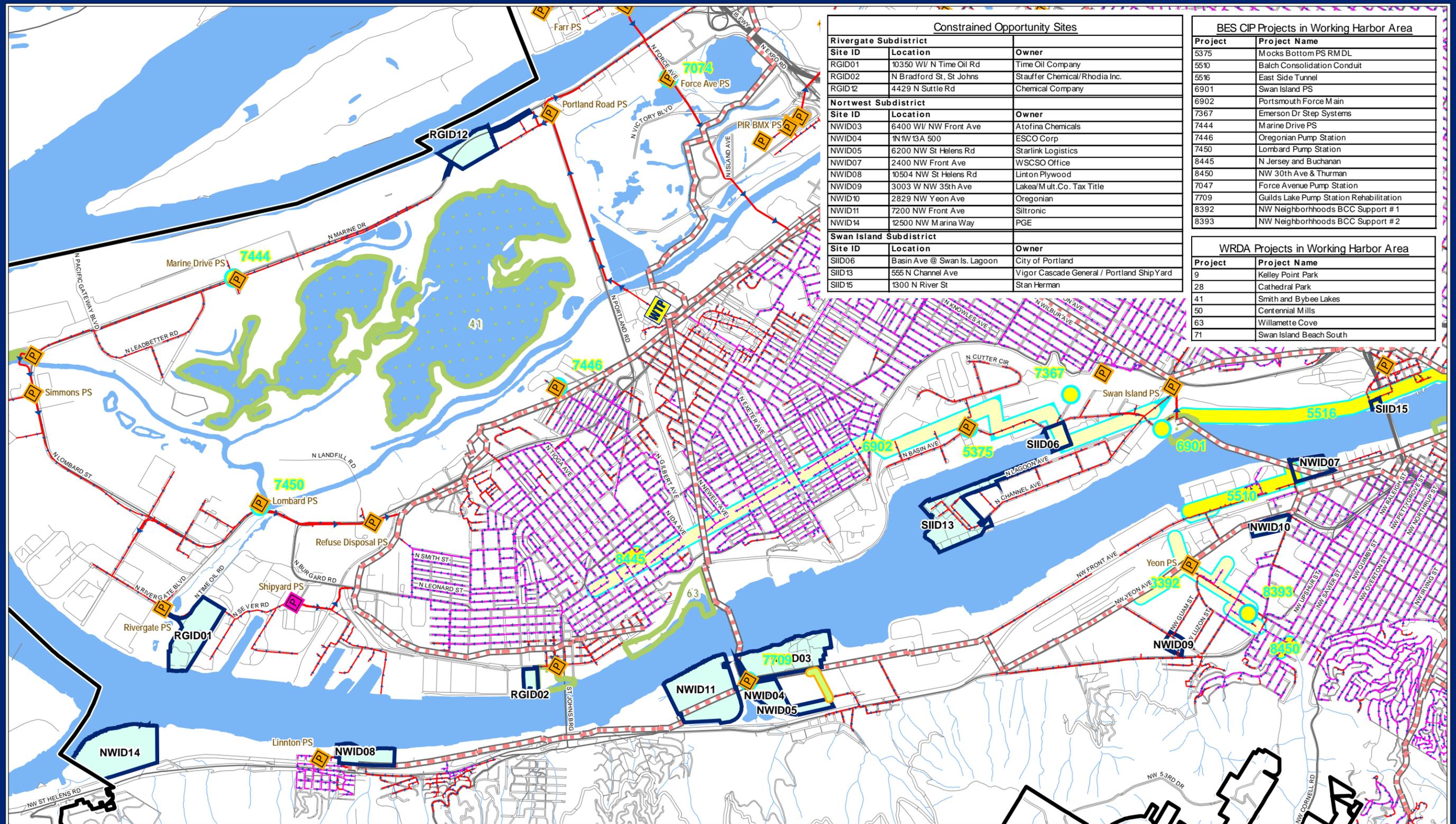
This accounts for two of the three infrastructure issues identified by this analysis. The third concerns the PGE Site NWID14, which is approximately a mile away from the nearest sanitary connection. To serve Site NWID14 with a full public sanitary system would require:

- 70 to 350 gallons per minute pump station
- Minimum diameter (4-inch) force main approximately 1.1 miles long
- Possible upgrade to Linnton Pump Station to convey additional sewage to Guilds Lake Pump Station

The cost to implement this type of sanitary system for the small number of potential customers anticipated renders it impractical and economically infeasible. Therefore, it will be necessary for the developer of this site to install and operate on-site facilities to handle sanitary and stormwater flows.

## Prioritization of Improvements

Only two potential public infrastructure improvements were identified as part of this infrastructure analysis for the Working Harbor Reinvestment Strategy Constrained Opportunity Sites. With so few projects to consider, it was found to be unnecessary to rank the improvements by priority in order to select which ones to carry forward for further evaluation in the engineering planning process. Both are recommended for further evaluation in the Sanitary and Storm System Plans.



Constrained Opportunity Sites		
Site ID	Location	Owner
<b>Rivergate Subdistrict</b>		
RGID01	10350 W/ N Time Oil Rd	Time Oil Company
RGID02	N Bradford St, St Johns	Stauffer Chemical/Rhodia Inc.
RGID12	4429 N Suttle Rd	Chemical Company
<b>Northwest Subdistrict</b>		
NWID03	6400 W/ NW Front Ave	Atofina Chemicals
NWID04	11414 13A 500	ESCO Corp
NWID05	6200 NW St Helens Rd	Starlink Logistics
NWID07	2400 NW Front Ave	WSCSO Office
NWID08	10504 NW St Helens Rd	Linton Plywood
NWID09	3003 W NW 35th Ave	Lakea/M ult.Co. Tax Title
NWID10	2829 NW Yeon Ave	Oregonian
NWID11	7200 NW Front Ave	Siltronic
NWID14	12500 NW Marina Way	PGE
<b>Swan Island Subdistrict</b>		
SIID06	Basin Ave @ Swan Is. Lagoon	City of Portland
SIID13	555 N Channel Ave	Vigor Cascade General / Portland ShipYard
SIID15	1300 N River St	Stan Herman

BES CIP Projects in Working Harbor Area	
Project	Project Name
5375	Mocks Bottom PS RMDL
5510	Balch Consolidation Conduit
5516	East Side Tunnel
6901	Swan Island PS
6902	Portsmouth Force Main
7367	Emerson Dr Step Systems
7444	Marine Drive PS
7446	Oregonian Pump Station
7450	Lombard Pump Station
8445	N Jersey and Buchanan
8450	NW 30th Ave & Thurman
7047	Force Avenue Pump Station
7709	Guids Lake Pump Station Rehabilitation
8392	NW Neighborhoods BCC Support # 1
8393	NW Neighborhoods BCC Support # 2

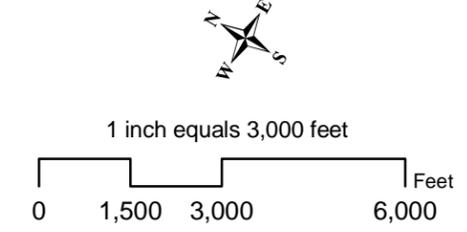
WRDA Projects in Working Harbor Area	
Project	Project Name
9	Kelley Point Park
28	Cathedral Park
41	Smith and Bybee Lakes
50	Centennial Mills
63	Willamette Cove
71	Swan Island Beach South



Legend	
	Constrained Opportunity Sites
	WRDA Project Sites (Water Resource Development Act)
	CIP Project Sites (Capital Improvement Projects)
	Waste Water Treatment Plant
	Pump Station
	Potential Improvement
	Major Interceptors
	Sanitary Sewer Pipe
	Force Main
	Combined Sewer Pipe
	Storm Sewer Pipe
	Storm Pressure Main
	Culvert
	Potential Public Storm Sewer Extension

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

*Potential and Planned Improvement Projects*



**CITY OF PORTLAND ENVIRONMENTAL SERVICES**  
Systems Analysis  
Spatial Analysis and Modeling

Map Type: Project Overview

Figure: ES - 1	Date Printed: 08/31/07
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# Introduction

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## Purpose of Report

The City of Portland Bureau of Environmental Services (BES) analyzed the projected sanitary sewer and stormwater infrastructure needs of three North Portland industrial sub-districts, along with fifteen potential industrial sites targeted for investment and development under the Working Harbor Reinvestment Strategy as prepared by the City of Portland Planning Bureau.

This report documents the results of that analysis, which included preliminary modeling of future infrastructure capacity deficiencies identified downstream of the industrial sites, an itemization of existing capital improvement plan (CIP) projects pertinent to the sites, identification of additional infrastructure improvements to address capacity constraints downstream of the sites, conceptual-level cost estimates to implement these improvements, and prioritization of the improvements.

## Overview of Working Harbor Reinvestment Strategy

The Working Harbor Reinvestment Strategy is being developed as a 10-year program of public investments by the City of Portland, Port of Portland (Port), and Portland Development Commission (PDC) to advance the economic vitality of the harbor industrial districts. These districts include Northwest, Swan Island, and Rivergate. Project goals are to stimulate private industrial reinvestment and competitiveness in these districts with public investments in infrastructure, developable land, and workforce, and to coordinate such investments among City bureaus, PDC, and the Port.

The Bureau of Planning is preparing the reinvestment strategy in partnership with the Port, PDC, Office of Transportation, Bureau of Environmental Services, and Water Bureau. The reinvestment strategy will be part of the River Plan, which is an area-planning project underway to address economic development, natural resources, recreation, and land use along the Willamette riverfront.

## Stormwater and Sanitary System Analysis Scope of Work

At the request of the City of Portland Planning Bureau, BES agreed to perform a 10-year infrastructure needs analysis regarding the stormwater and sanitary sewer systems as follows:

- I. Characterize Existing System & Deficiencies (capacity and condition) for the Stormwater & Sanitary Infrastructure Needed to Support District Growth
  - A. Develop Maps and summary tables of existing stormwater & systems

1. By Industrial Area Sub-districts: Swan Island, Northwest, & Rivergate (See Industrial District Atlas, 2004)
    2. By Selected Industrial Sites (15)
  - B. Describe significant deficiencies in the current sewer/stormwater systems in the harbor industrial districts
    - 1.
  - C. Evaluate and confirm deficiencies identified in project interviews with area businesses (to be provided by Bureau of Planning).
- II. Characterize Current Stormwater & Sanitary System CIP Projects for Next 10-Years in Harbor Sub-districts.
  - A. Develop maps and summary tables by sub-district of the projects in CIP that are in process or will be implemented by 2017.
  - B. Develop maps and summary tables for projects that directly serve Selected Industrial Sites
- III. Develop and Recommend System Improvements in Harbor Sub-Districts for Next 10-Years.
  - A. General Improvements for Sub-Districts
    1. Sanitary System Improvements
    2. Stormwater System Improvements
  - B. System Improvements to Support Development of Specific Sites using development assumptions provided by Planning Bureau (Average increased water consumption data provided by Water Bureau Report Table 52 & Figure 33)
    1. Sanitary System Improvements
    2. Stormwater System Improvements
  - C. Provide summary of capacity improvements, area served, and approximate cost estimates
  - D. Prioritize Improvements according to the following considerations:
    1. Ability to meet 10-year employment and land absorption forecasts (provided by Bureau of Planning),
    2. System deficiencies identified above
    3. Project-selection criterion that gives weight to economic development catalyst projects:
      - a. *Identified by businesses as priority to support traded sector investment.* Score 1 for projects identified as a high priority in business interviews (e.g., stormwater rates). Score 2 for projects identified as a high priority by many business leaders (e.g., Harbor Superfund project).
      - b. *Support traded sector land supply and development.* Score 1 for projects that improve capacity, remove impediments, or enhance access in the project area (a traded-sector employment area). Score 2 for projects that also directly support

development of 20 or more acres of land development in the project area.

- E. Analyze (e.g., cost estimates and next steps, as budget allows) and consider whether to recommend adding the project to the Public Facilities Plan for evaluation and potential recommendation to the CIP process.

IV. Develop Draft & Final Report

- A. Incorporate results into draft report and provide for BES and Planning Bureau Review
- B. Assemble comments and updates into a Final Report.



# Study Area and Existing System

---

The study area for this stormwater and sanitary sewer infrastructure analysis encompasses fifteen Constrained Opportunity Sites identified by the Working Harbor Reinvestment Strategy project for evaluation. These sites are located in the Rivergate, Northwest, and Swan Island industrial subdistricts. The sanitary and combined sewer basins associated with the Constrained Opportunity Sites are delineated in Figure 2-1 and summarized in Table 2-1. In the sanitary sewer basins the sanitary sewers are separated from the stormwater sewers. In the combined sewer basins, sanitary and stormwater sewers are combined into one system.

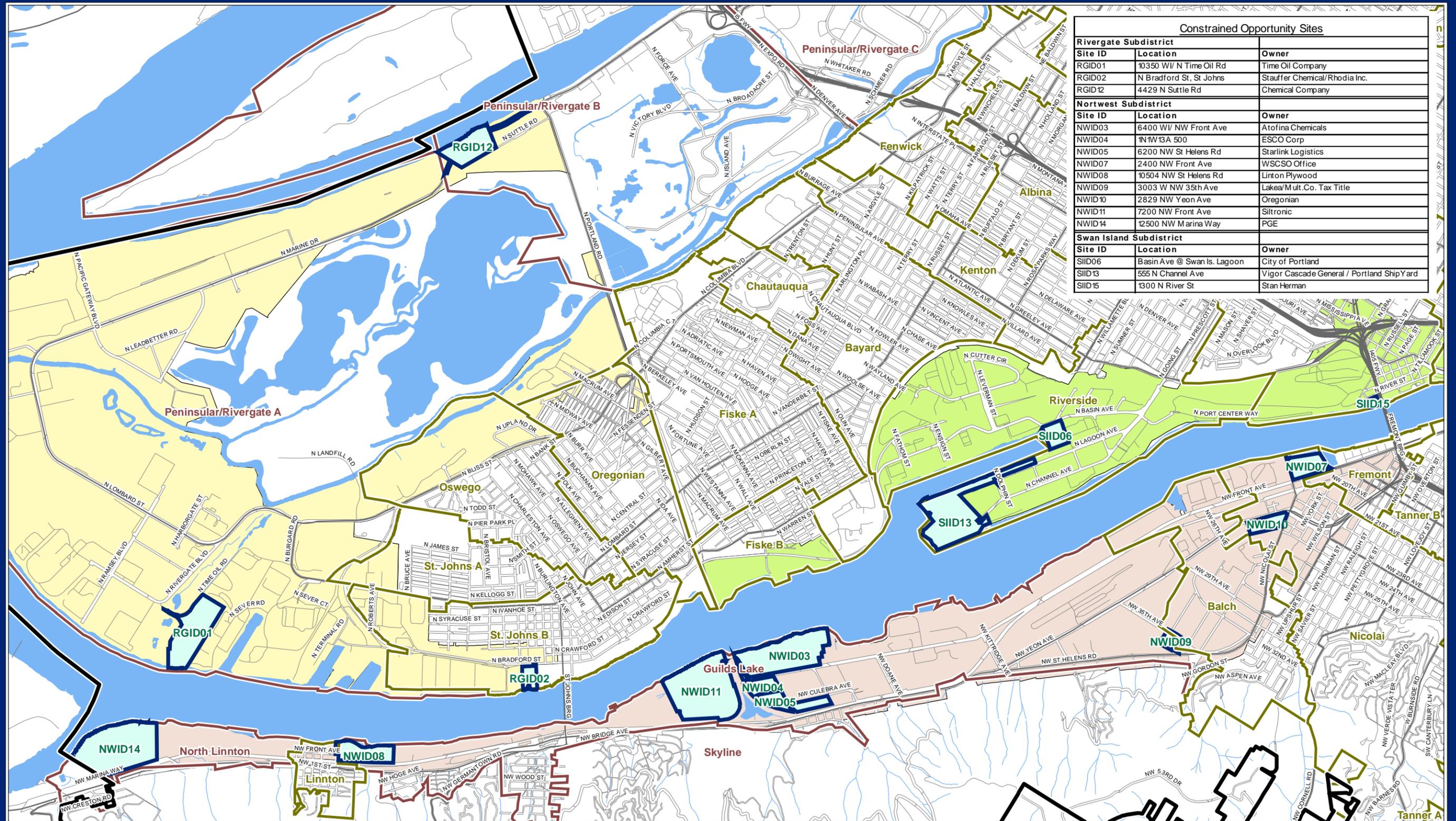
**Table 2-1 Constrained Opportunity Site Sanitary and Combined Sewer Basins**

<b>Constrained Opportunity Site Systems Analysis ID</b>	<b>Basin</b>
<b>Rivergate Industrial Subdistrict</b>	
RGID01	Peninsular/Rivergate A Sanitary Sewer
RGID02	St. Johns B Combined Sewer
RGID12	Peninsular/Rivergate B Sanitary Sewer
<b>Northwest Industrial Subdistrict</b>	
NWID03	Guilds Lake Sanitary Sewer
NWID04	Guilds Lake Sanitary Sewer
NWID05	Guilds Lake Sanitary Sewer
NWID07	Nicolai Combined Sewer
NWID08	Linnton Combined Sewer
NWID09	Guilds Lake Sanitary Sewer
NWID10	Nicolai Combined Sewer
NWID11	Guilds Lake Sanitary Sewer
NWID14	No sanitary sewer system in the area; nearest system is North Linnton Sanitary Sewer
<b>Swan Island Subdistrict</b>	
SIID06	Riverside Combined Sewer
SIID13	Riverside Combined Sewer
SIID15	Beech-Essex Combined Sewer

The existing sewer system is shown in Figure 2-2. This shows the stormwater, sanitary, and combined sewer infrastructure located in the vicinity of the Constrained Opportunity Sites. Also shown are potential flood hazard areas, which overlap some of the sites. [The source of the flood hazard delineation is a compilation of Portland Planning Bureau and METRO Title 5 GIS coverages. It represents the 100-year floodplain and 1996 flood inundated areas, which represents the likely extent of flooding in the area. This delineation can impact the requirements and limitations for development on a given site.]

The City's hierarchy of wastewater pump stations, interceptors, and tunnels is shown schematically in Figure 2-3 with pump stations downstream of the Constrained Opportunity Sites highlighted.

Group Mckenzie completed an initial review of the development potential of the Constrained Opportunity Sites. Their conclusions are summarized along with ownership and location information in Table 2-2. The Working Harbor Reinvestment Strategy site numbers are shown on Table 2-2 with the corresponding system analysis identification numbers for cross reference. This report uses the system analysis identification numbers to be consistent with the Water Bureau analysis report. The system analysis identification number prefixes signify the industrial subdistrict where the site is located. RG is an abbreviation for Rivergate, NW for Northwest, and SI for Swan Island.



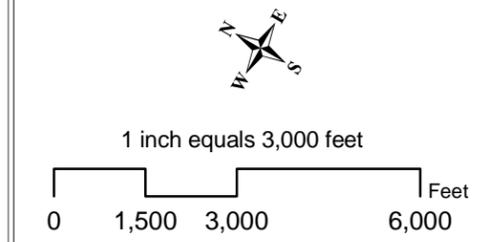
Constrained Opportunity Sites		
<b>Rivergate Subdistrict</b>		
Site ID	Location	Owner
RGID01	10350 W/ N Time Oil Rd	Time Oil Company
RGID02	N Bradford St, St Johns	Stauffer Chemical/Rhodia Inc.
RGID12	4429 N Suttle Rd	Chemical Company
<b>Nortwest Subdistrict</b>		
Site ID	Location	Owner
NWID03	6400 W/ NW Front Ave	Atofina Chemicals
NWID04	1N W 13A 500	ESCO Corp
NWID05	6200 NW St Helens Rd	Starlink Logistics
NWID07	2400 NW Front Ave	WSCSO Office
NWID08	10504 NW St Helens Rd	Linton Plywood
NWID09	3003 W NW 35th Ave	Lakea/ Mult.Co. Tax Title
NWID10	2829 NW Yeon Ave	Oregonian
NWID11	7200 NW Front Ave	Silttronic
NWID14	12500 NW Marina Way	PGE
<b>Swan Island Subdistrict</b>		
Site ID	Location	Owner
SIID06	Basin Ave @ Swan Is. Lagoon	City of Portland
SIID13	555 N Channel Ave	Vigor Cascade General / Portland Ship Yard
SIID15	1300 N River St	Stan Herman



Legend	
	City of Portland
	Constrained Opportunity Sites
	Combined Sewer Basins
	Sanitary Sewer Basins
North Harbor Industrial Districts	
	Northwest Industrial District
	Rivergate Industrial District
	Swan Island Industrial District

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

*Sanitary Sewer and Combined  
Sewer Basin Boundaries*



**CITY OF PORTLAND  
ENVIRONMENTAL SERVICES  
Systems Analysis**  
Spatial Analysis and Modeling

Map Type: Project Overview

Figure: 2 - 1	Date Printed: 08/31/07
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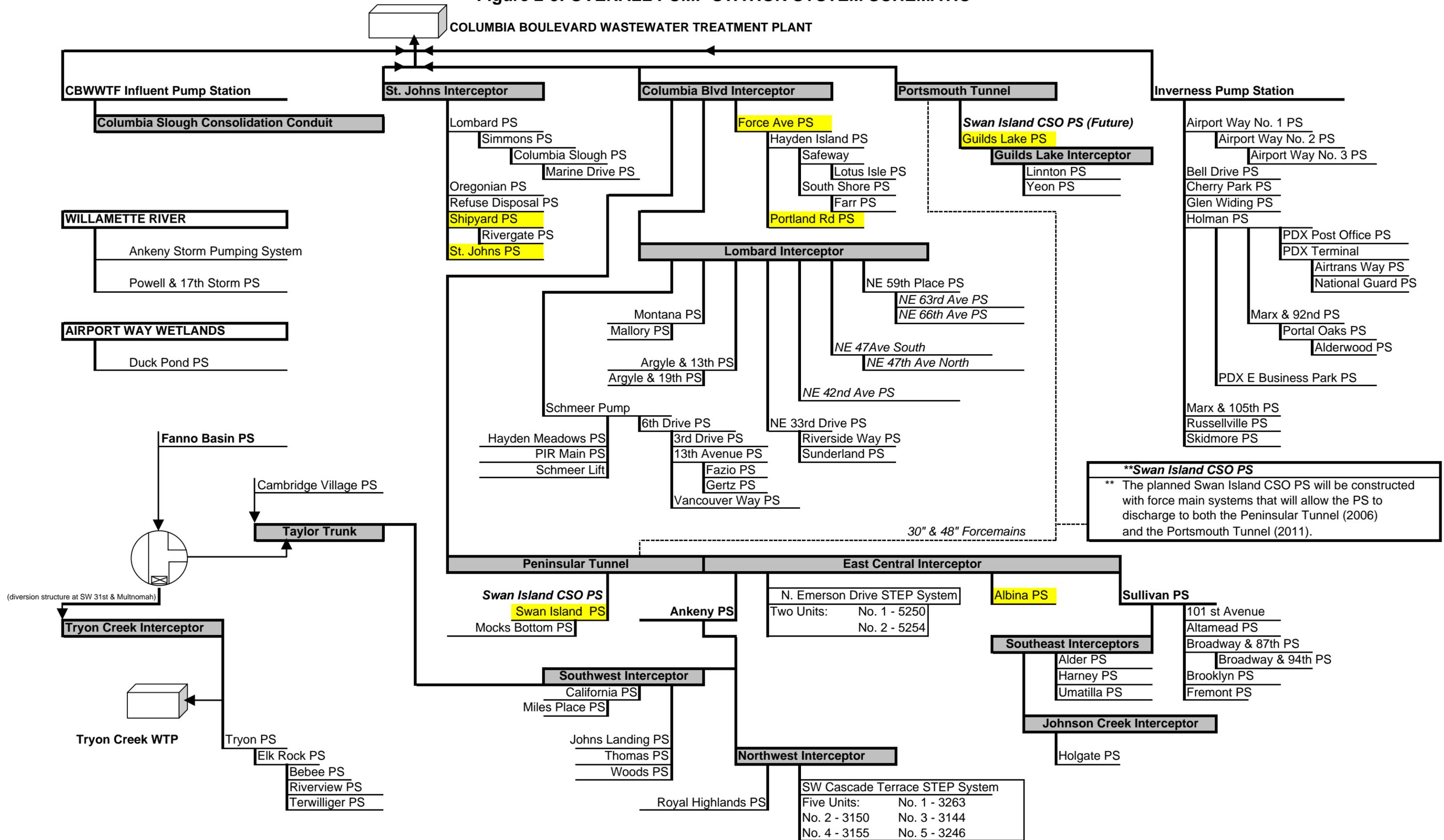


TABLE 2-2  
Working Harbor Reinvestment Strategy, Constrained Opportunity Sites Proposed for Infrastructure Analysis

PDC Site No.	System Analysis ID	Site Owner	Location	Assumed Developable Acres	Group Mackenzie (GM) or Parsons Brinkerhoff (PB) Analysis	GM or PB Infrastructure Needs Identified	Special Issues to Consider	Notes
<b>Unoccupied Brownfields</b>								
1	RGID01	Time Oil	N. Time Oil Rd., Rivergate	45-acre unoccupied site	GM: 465,000 sf distribution, 137,500 sf flex space	GM: \$510,000 street upgrade, CIP includes \$260,000 drainage and \$405,000 sewer improvements on Time Oil Rd.	Owner requests taking public street	
2	RGID02	Langley St. Johns (south half of former Marcom site)	N. Bradford St., St. Johns	7-acre unoccupied site			Substandard street with railroad, possible access from T-4	
3	NWID03	Arkema	N. end of NW Front, Northwest	59-acre unoccupied site				
4	NWID04	ESCO	N. end of NW Front, Northwest	10-acre unoccupied site	GM: 450,000 sf mfg., site combined with Aventis	GM: \$24,000 for half street, site combined with Gould/RP		Reclaimed landfill site
5	NWID05	Aventis Cropscience USA LP	N. end of NW Front, Northwest	16-acre unoccupied site	GM: 450,000 sf mfg., site combined with ESCO	GM: \$24,000 for half street, site combined with ESCO	BNSF proposes closing Balboa Railroad crossing	
6	SIID06	City of Portland – BES (Swan Is. lagoon site)	Basin Ave. at Swan Island lagoon	10-acre vacant (unimproved) site	GM: 225,000 sf distribution, 106,000 sf flex space	GM: \$50,000 improvements to Basin Ave., \$50,000 to Lagoon Ave. frontage		Floodplain, temporary use for CSO project
7	NWID07	City of Portland – BES (T-1 North)	2400 NW Front, Northwest	19-acre unoccupied site				Temporary use for CSO project
8	NWID08	Linnton Plywood	10504 NW St. Helens Rd., Linnton	25-acre unoccupied site	PB: six flex space parcels	PB: \$3.1 million street, \$1.1 million rail crossing, \$1.9 million sewer/water/stormwater, \$2.9 million pump station replacement	Consider large single user, dead end water line, railroad crossing	
9	NWID09	Lakea Corp.	3003 NW 35 <sup>th</sup> Ave., Northwest	1-acre unoccupied site			Cost of improvements on small site	
<b>Vacant / Partly Vacant Sites</b>								
10	NWID10	Oregonian	NW Yeon at Nicolai, Northwest	11-acre vacant site	GM: 150,000 sf of general industrial, 20,000 sf office	GM: \$40,000 improvements to Yeon Ave. frontage, 5-foot R/W dedication, may benefit from traffic signal.		Long-term vacancy
11	NWID11	Siltronic	7200 NW Front, Northwest	15 vacant acres on 80-acre site			Consider Front Ave. extension to cul-de-sac	DEQ active investigation
12	RGID12	Stauffer Chemical	4429 N Suttle Rd., Rivergate	15 vacant acres on 31-acre site				DEQ active cleanup, floodplain
<b>Redevelopment/Expansion Sites</b>								
13	SIID13	Vigor (Cascade General)	5555 N. Channel Ave., Swan Island	25 redevelopment acres on 65-acre site				
14	NWID14	PGE	12500 NW Marina Way, Linnton	18 redevelopment acres + 16 vacant acres on 74-acre site			Dead end water line, railroad crossing	24-acre Greenway Natural zone, 38-acre mapped wetland
15	SIID15	Malafouris	1300 N. River St., Lower Albina	2-acre site			Substandard street with railroad, cost of improvements on small site	Riverfront site not in river-dependent use

# Sewer Infrastructure Issues

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## Approach

The Bureau of Environmental Services (BES) performed hydrologic and hydraulic modeling to analyze sewer infrastructure issues in the study area for existing and future conditions. The sanitary, combined, and stormwater systems were analyzed separately using methods and criteria appropriate to each.

### Sanitary Sewer Basins

Sanitary sewer models for this analysis were developed using the sanitary sewer *explicit modeling* approach developed as part of the BES Sanitary Sewer System Plan. This is a very accurate and reliable model that is currently used in model production work for a variety of modeling tasks.

The sanitary sewer explicit modeling approach included models for both existing (2005) and future (2015) conditions. Existing conditions were based on development assumption data compiled in 2005. Year 2015 conditions were developed by modeling both existing (2005) and future (2040) scenarios and assuming a linear increase in flows over this time period. The 2040 scenarios were previously established for ongoing system planning modeling based on development assumptions provided by the City of Portland Bureau of Planning and approved by the BES Standards & Practices committee. In addition to the interpolated 2015 flow, anticipated flows from the 15 proposed development sites were added to the manholes where the proposed development was deemed likely to connect to the existing sewer system.

The sanitary sewer basins were modeled for the 5-year design storm. The model reflects system response to estimated 2015 flow from all properties in the basin along with flows from the Constrained Opportunity Sites. The expected flows from the 15 sites were assumed to be equal to the water demand estimated by the Water Bureau. The sub-district system was analyzed as a complete system and did not isolate individual site contributions to downstream capacity deficiencies.

### Combined Sewer Basins

For Constrained Opportunity Sites located in combined sewer basins, this analysis relied on the recently completed combined sewer system plan hydraulic modeling results, which are documented for each of the combined basins in the *Combined Sewer Basin Hydraulic Characterization Technical Memoranda* (BES, 2006). These results are from the most accurate and reliable models used in systems analysis.

The existing conditions assumed for the combined sewer basins were the same as those assumed for the sanitary basins; that is, they were based on 2005 data. The design storm for capacity analysis of the combined system is the 25-year event. Future 2015 conditions were

not computed as part of the system planning effort and were not required to determine what capacity issues may be related to development of the constrained sites in the combined basins. This is because the capacity deficiencies in the combined system are predominantly caused by storm flows into the combined system. The sanitary flows from the Constrained Opportunity Sites in 2015 would be insignificant contributors to system capacity deficiencies. Therefore, analyzing the capacity of the existing system is sufficient for this study.

## Stormwater Infrastructure

For new developments and redevelopments, the standard City of Portland stormwater management approach is to limit stormwater runoff from the development site. The details of this approach are described in the City of Portland Bureau of Environmental Services September 2004 *Stormwater Management Manual* (SWMM). The applicable level of on-site stormwater management depends on technical feasibility.

The range of stormwater management approaches is bracketed by the following two options:

**Option A.** Stormwater is infiltrated on-site to the maximum extent possible with any excess disposed, after treatment, to the river. This approach would involve permitting for the direct discharge to the river.

**Option B.** All stormwater runoff from new development is conveyed to public storm facilities after treatment onsite.

This analysis evaluates Option B to determine the maximum possible public infrastructure that may be necessary to address run off created by development of the constrained sites.

The site stormwater needs analyses were performed using a standard engineering estimate for runoff called the *Rational Method*, or a commercial numerical hydraulics modeling program called XP-SWMM, depending on site and system characteristics and other factors such as data availability. For example, if the site or drainage area was less than 50 acres, the Rational Method was used. The Rational Method, which is a standardized approach described in the City's *Sewer and Drainage Facilities Design Manual*, is generally observed to produce higher peak flow estimates than XP-SWMM. Stormwater modeling for this type of analysis is based on rudimentary estimation methods. The modeling of stormwater is the least reliable of the three systems analyzed because of the complex nature of hydrologic events and the preliminary nature of available data. In keeping with regulatory requirements, stormwater capacity needs were evaluated using the 10-year design storm.

BES analyzed public stormwater infrastructure needs using "incremental flow rates," which consisted of only those flows attributable to the "assumed developable acres" specified in the Planning Bureau's matrix of Constrained Opportunity Site information (See Table 2-2). Developments were assumed to be commercial with 85-percent of the area covered by impervious surfaces. Because the upstream areas are already nearly built out and consist primarily of industrial and commercial land uses that are currently assigned high impervious percentages, it was not considered necessary to model system capacity based on estimated future conditions. Future conditions are likely to have similar amounts of impervious surfaces as existing conditions. Also, in most cases the stormwater system was observed to have extra capacity that would be expected to be adequate to handle marginally increased

potential upstream runoff flows. Moreover, the SWMM requirements for increased on-site stormwater management of new developments and redevelopments should help to curb stormwater runoff increases in the basins.

## Sewer Infrastructure Issues

Significant sewer infrastructure characteristics and issues are summarized in Table 3-1 for the fifteen Constrained Opportunity Sites and discussed for each of the systems separately below. Infrastructure issues identified to occur in the vicinities of the Constrained Opportunity Sites are shown in Figures 3-1 through 3-11.

**Table 3-1 Summary of Significant Infrastructure Issues**

Site ID	Significant Associated Infrastructure Issues
<b>Rivergate Subdistrict</b>	
RGID01	Downstream sanitary sewer Shipyard Pump Station has insufficient capacity to handle existing and future condition flows.
RGID02	None.
RGID12	None.
<b>Northwest Subdistrict</b>	
NWID03	None.
NWID04	None.
NWID05	No capacity issues, but nearest connection to stormwater pipe is approximately 1,140 feet away.
NWID07	None.
NWID08	None.
NWID09	None.
NWID10	None.
NWID11	None.
NWID14	Nearest sanitary sewer connection is approximately a mile away and downstream system has insufficient capacity to handle additional flows from the site.
<b>Swan Island Subdistrict</b>	
SIID06	None.
SIID13	None.
SIID15	None.

## **Sanitary Sewer Basins**

Hydraulic analyses indicated that most of the sanitary sewer basins serving the Constrained Opportunity Sites have no significant capacity deficiencies for the planning period. The exceptions were the Shipyard Pump Station, which serves RGID01, and the lack of a sanitary sewer system in the vicinity of NWID14. These deficiencies are described separately below.

### **RGID01: Shipyard Pump Station**

This Shipyard Pump Station, shown in Figure 3-1, is technically under-capacity for the estimated flows for the 2015 conditions. This pump station has a rated firm capacity of 1,200 gallons per minute (gpm), which is the capacity when one pump is running and the backup pump is off. Yet the peak modeled flow for existing conditions during the 5-year design storm is estimated at 2,500 gpm. The pump station keeps up by running both pumps during large storms for short peak period. The future condition flow for 2015 conditions during the 5-year design storm is estimated at 2,750 gpm. Therefore, we would expect this pump station to eventually be overloaded and should be analyzed in more detail to determine the true upgrade needs.

### **NWID14: No Sanitary Sewer Basin**

The PGE site, shown in Figure 3-8, is in an area of the city where sanitary sewer system currently exists. Most properties in this area are likely served by older septic systems. The nearest sanitary connection is the Linnton system located approximately one mile away.

## **Combined Sewer Basins**

Based on a review of recently completed hydraulic modeling results, the proposed developments or redevelopments of the Constrained Opportunity Sites are not expected to cause any downstream hydraulic deficiencies in the combined system by the year 2015.

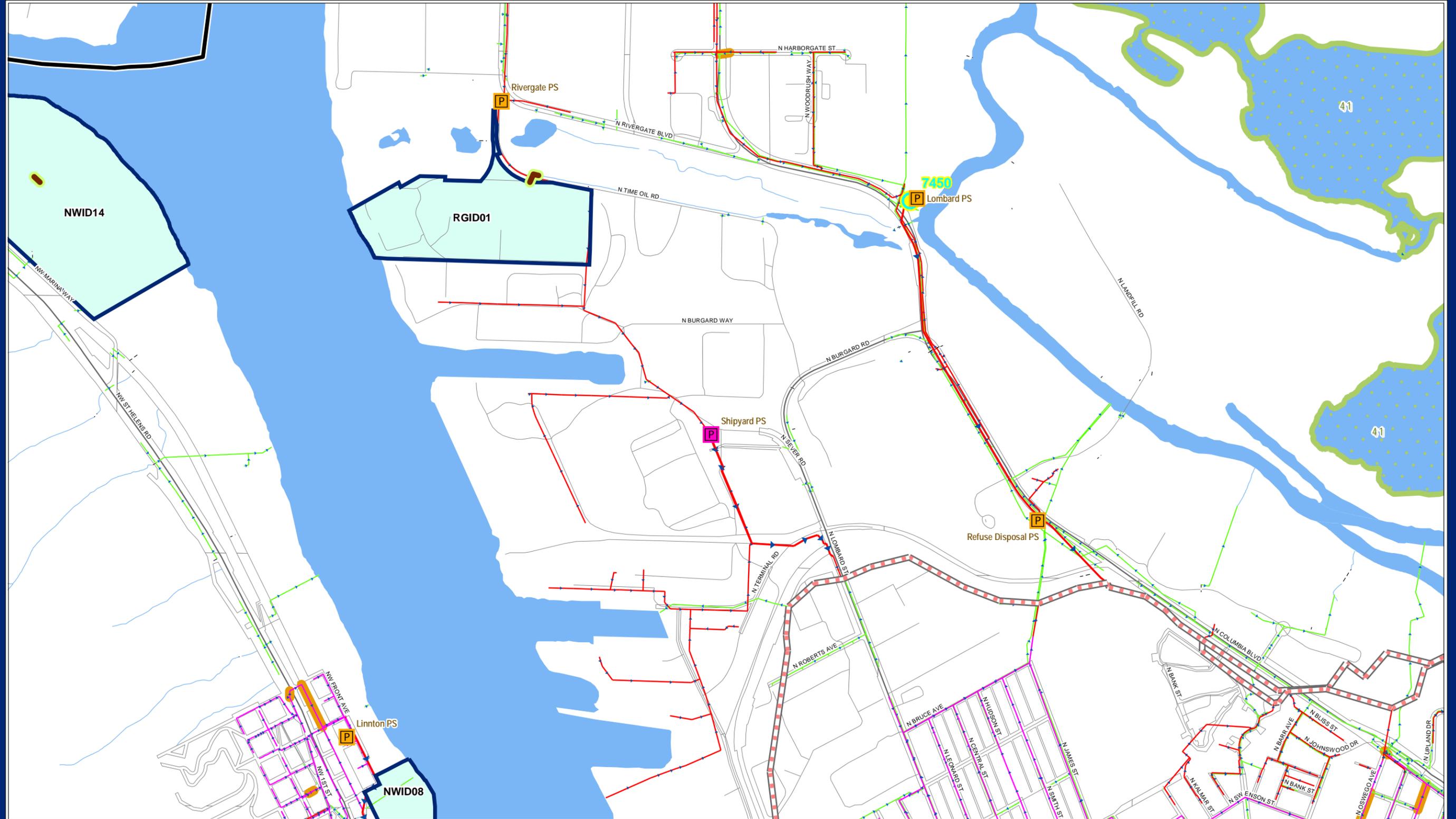
However, the NWID07 and NWID10 sites are located in a combined basin that is predicted to have hydraulic deficiencies by the year 2040. The Northwest Neighborhoods Predesign combined system basin model shows hydraulic capacity issues downstream of NWID07 and NWID10. These capacity issues are predominantly caused by stormwater flows into the combined system. The sanitary flows from NWID07 and NWID10 are insignificant contributions to the flows creating the hydraulic deficiencies. The projects recommended to address these hydraulic deficiencies are not considered critical and may not be built within the 10-year planning window for the constrained site development.

The 2040 system deficiencies and recommended projects are displayed on Figure 3-5 for informational purposes. They are not caused by and very likely will not impact the development of the constrained sites within the 10-year planning window.

## **Stormwater Infrastructure**

The stormwater infrastructure analysis concluded that the existing stormwater systems have sufficient capacity to accommodate stormwater flows from all of the Constrained Opportunity Sites assuming all of the stormwater flows are conveyed to the City's stormwater system. However, for Site NWID05 it will be necessary to extend the public stormwater system pipeline approximately 1,140 feet.

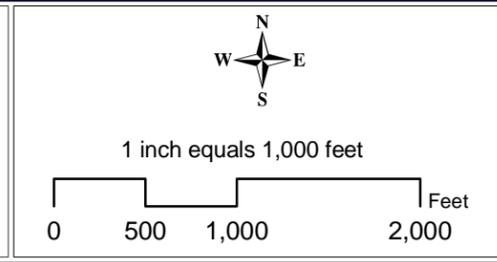
Information gathered as part of the stormwater infrastructure analysis is summarized in Appendix A.



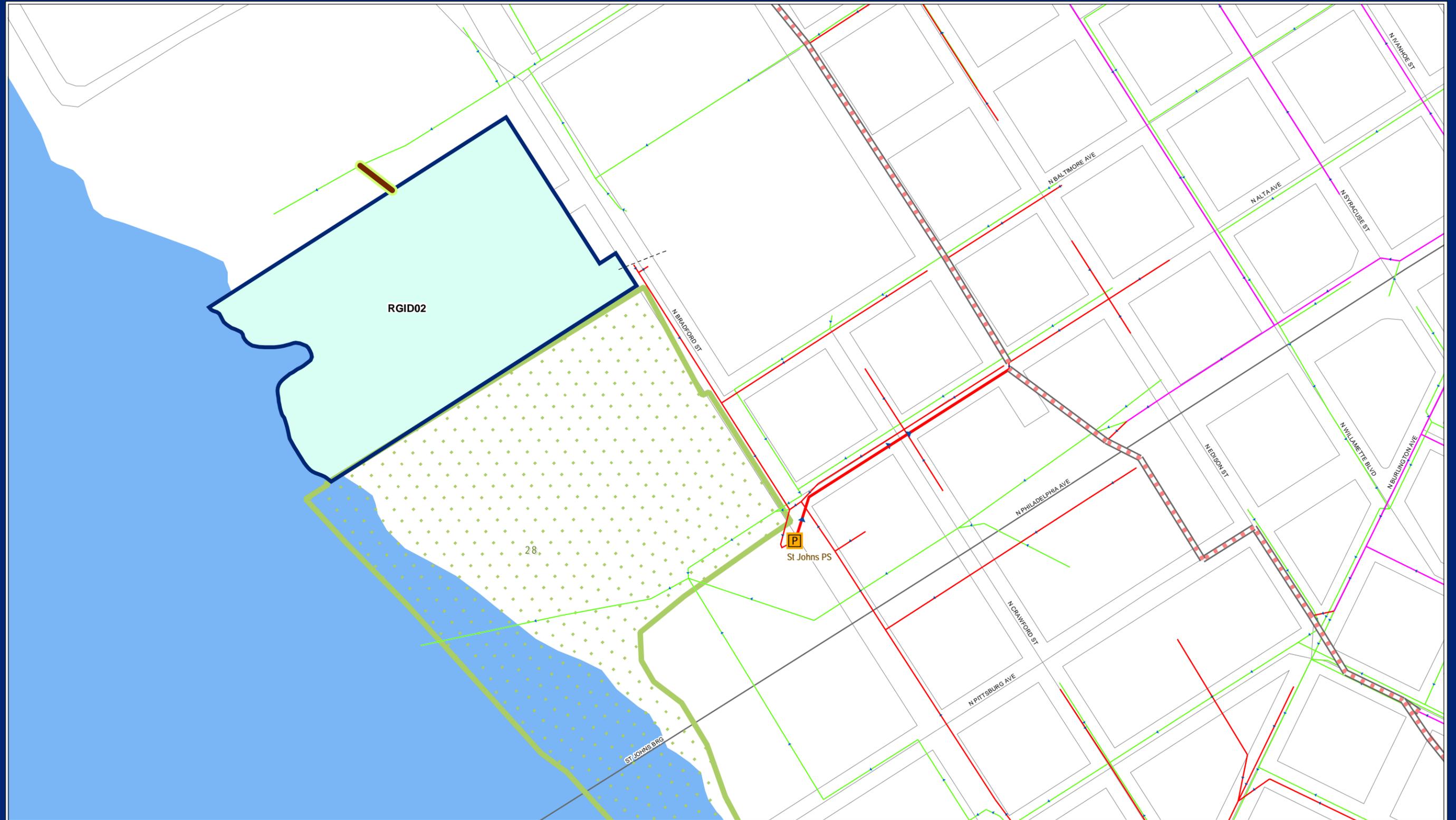
Legend	
	Constrained Opportunity Sites
	WRDA Project Sites (Water Resource Development Act)
	CIP Project Sites (Capital Improvement Projects)
	Conceptual Public Storm System Connections
	Pump Station Capacity Deficiency
	Pump Station
	Major Interceptors
	Sanitary Sewer Pipe
	Forcemain
	Combined Sewer Pipe
	Storm Sewer Pipe
	Storm Pressure Main
	Culvert
	Pipes in Poor Condition

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

*Sewer Infrastructure Issues in the Vicinity of Opportunity Sites*



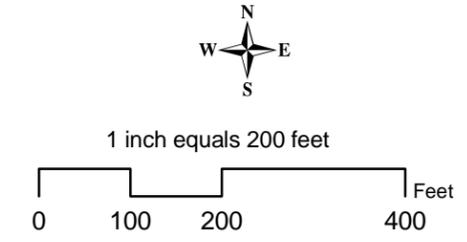
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Figure: 3 - 1	Date Printed: 08/31/07



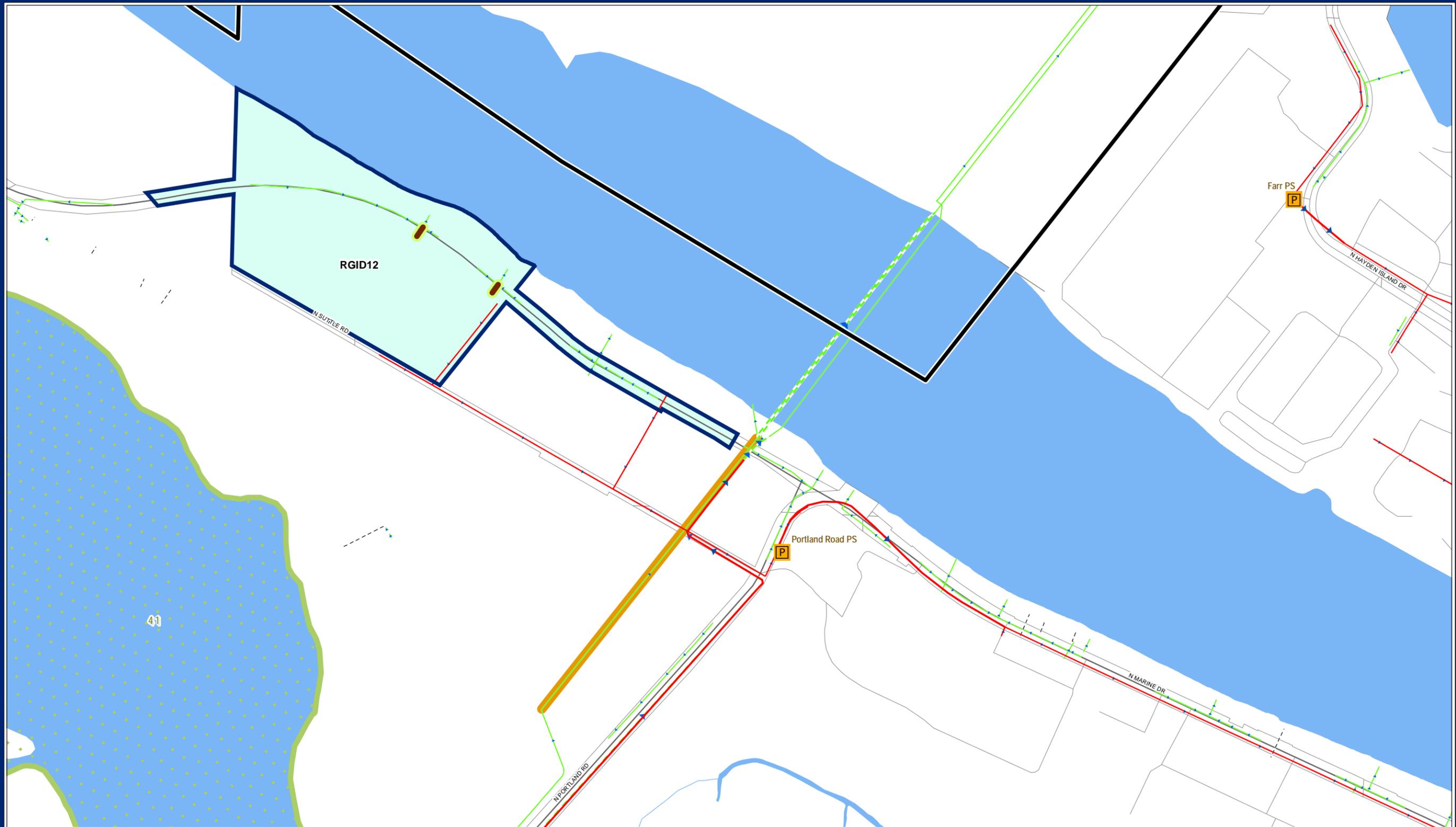
Legend			
	City of Portland		Major Interceptors
	Constrained Opportunity Sites		Sanitary Sewer Pipe
	WRDA Project Sites (Water Resource Development Act)		Forcemain
	CIP Project Sites (Capital Improvement Projects)		Combined Sewer Pipe
	Conceptual Public Storm System Connections		Storm Sewer Pipe
	Pump Station		Storm Pressure Main
			Culvert
			Pipes in Poor Condition

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

*Sewer Infrastructure Issues  
Affecting Opportunity Sites*



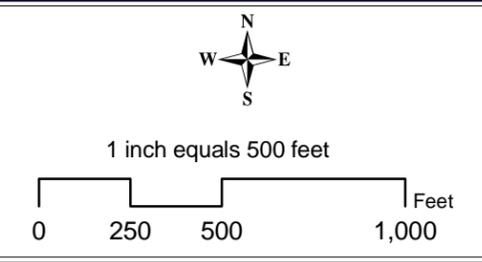
<b>Systems Analysis</b> Spatial Analysis and Modeling	
Map Type: Site View - RGID02 N Bradford St, St Johns	
Figure: 3 - 2	Date Printed: 08/31/07



Legend	
	City of Portland
	Constrained Opportunity Sites
	WRDA Project Sites (Water Resource Development Act)
	CIP Project Sites (Capital Improvement Projects)
	Conceptual Public Storm System Connections
	Pump Station
	Major Interceptors
	Sanitary Sewer Pipe
	Forcemain
	Combined Sewer Pipe
	Storm Sewer Pipe
	Storm Pressure Main
	Culvert
	Pipes in Poor Condition

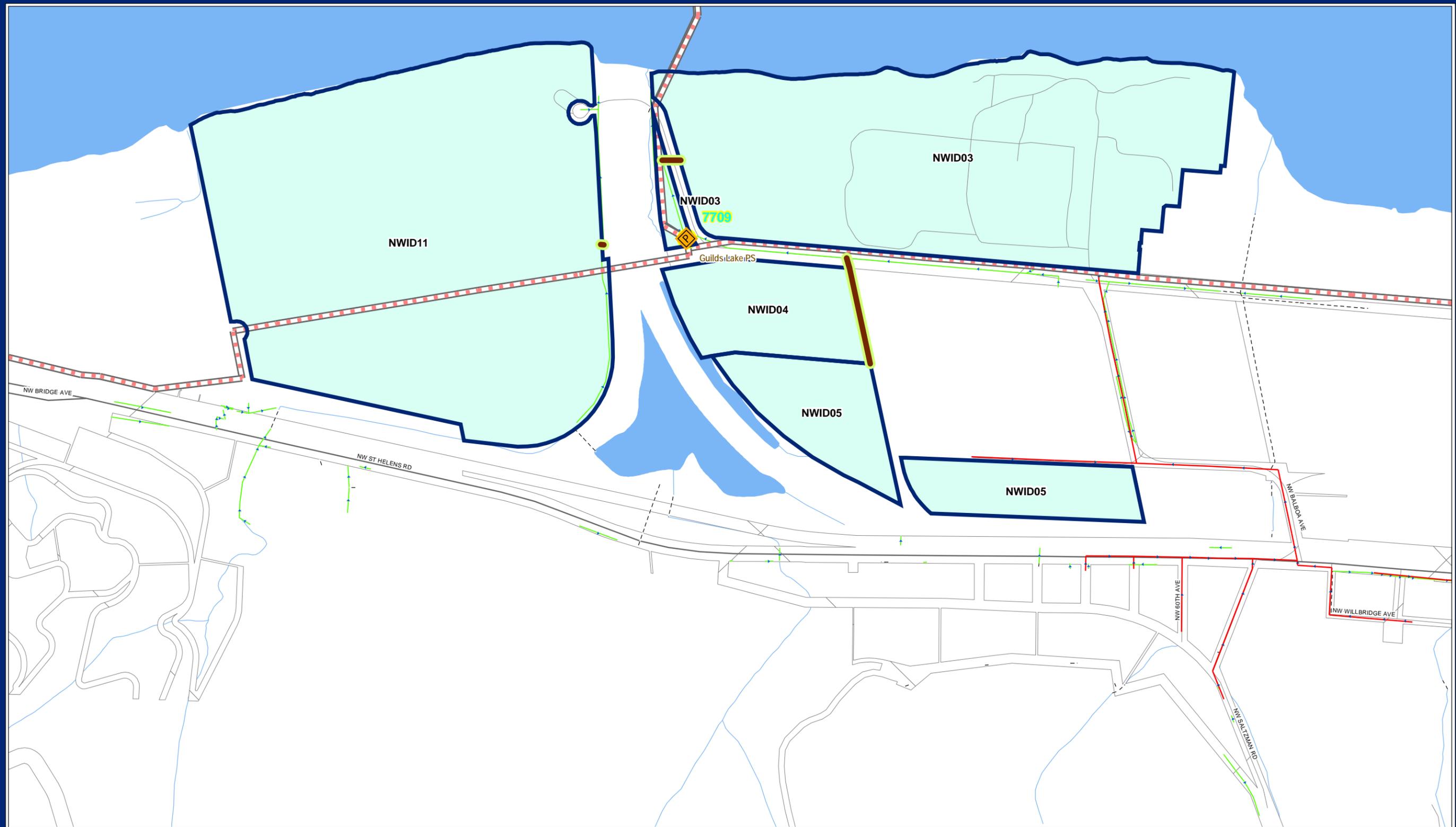
## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

### Sewer Infrastructure Issues in the Vicinity of Opportunity Sites



<b>CITY OF PORTLAND ENVIRONMENTAL SERVICES</b> <b>Systems Analysis</b> <small>Spatial Analysis and Modeling</small>	
Map Type: Site View - RGID12 4429 N Suttle Rd	
Figure: 3 - 3	Date Printed: 08/31/07

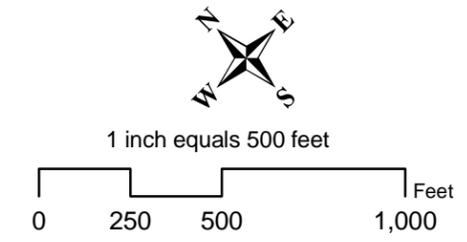
Produced by Systems Analysis: Map Request 4403 (KDR) August, 24th, 2007 \\Cassio\Modelling\Projects\6690\_NorthHarbor\GIS\Data\ArcWxd\Phase\_2\NW\ID03.mxd



Legend			
	City of Portland		Major Interceptors
	Constrained Opportunity Sites		Sanitary Sewer Pipe
	WRDA Project Sites (Water Resource Development Act)		Forcemain
	CIP Project Sites (Capital Improvement Projects)		Combined Sewer Pipe
	Conceptual Public Storm System Connections		Storm Sewer Pipe
	Pump Station		Storm Pressure Main
			Culvert
			Pipes in Poor Condition

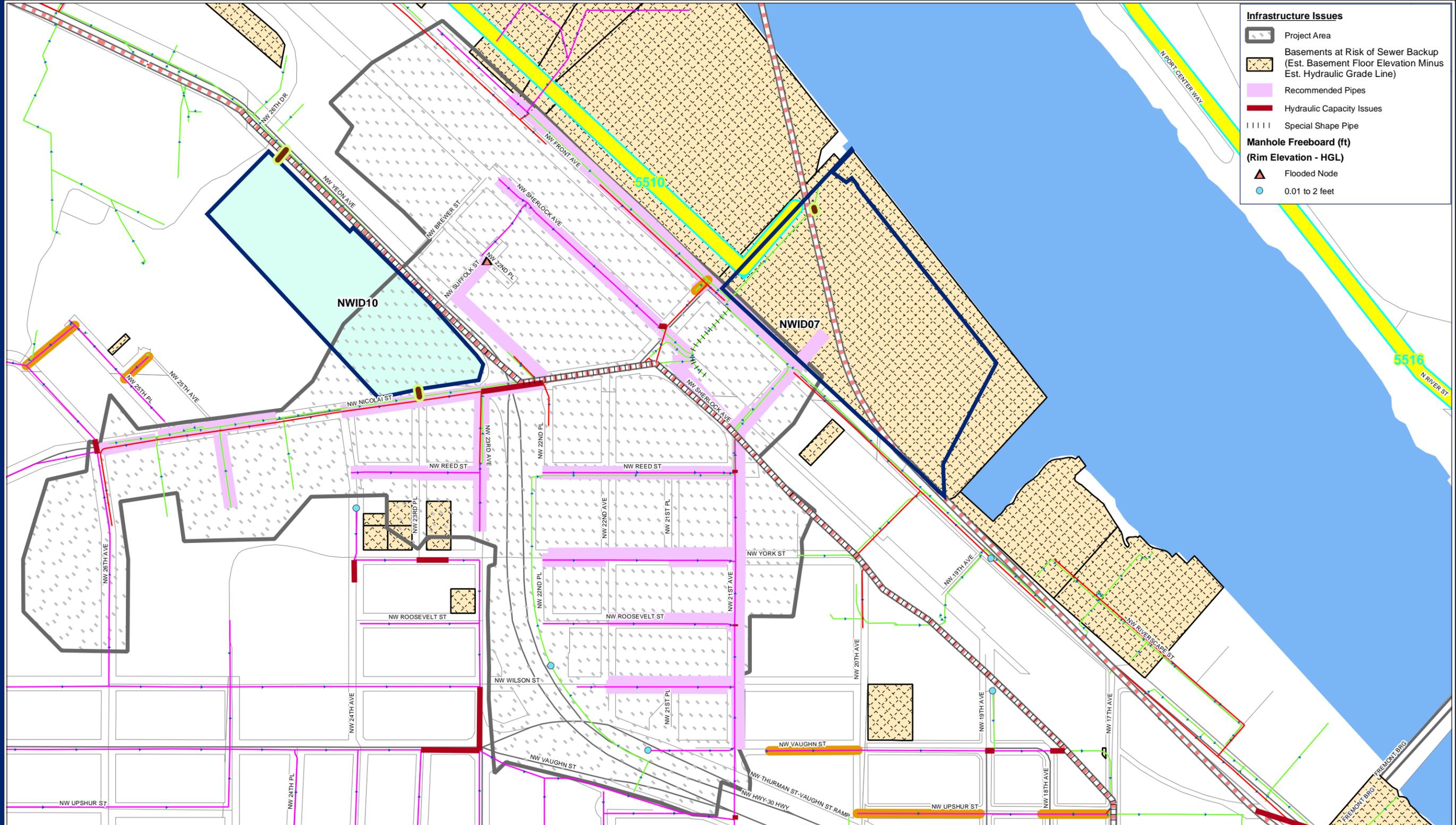
## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

*Sewer Infrastructure Issues in the  
Vicinity of Opportunity Sites*



 <b>Systems Analysis</b> Spatial Analysis and Modeling	
<b>Map Type:</b> Site View - NWID03 6400 W/ NW Front Ave, NWID04 Taxlot 1N1W13A 500, NWID05 6200 NW St Helens Rd, NWID11 7200 NW Front Ave	<b>Date Printed:</b> 08/31/07
<b>Figure:</b> 3 - 4	<b>Date Printed:</b> 08/31/07

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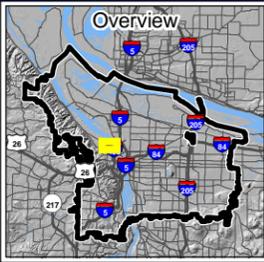


**Infrastructure Issues**

- Project Area
- Basements at Risk of Sewer Backup (Est. Basement Floor Elevation Minus Est. Hydraulic Grade Line)
- Recommended Pipes
- Hydraulic Capacity Issues
- Special Shape Pipe

**Manhole Freeboard (ft) (Rim Elevation - HGL)**

- Flooded Node
- 0.01 to 2 feet

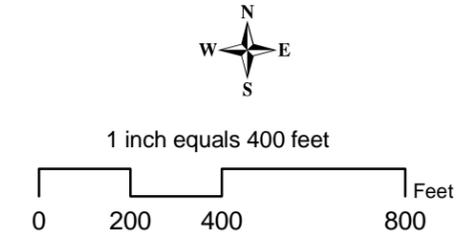


**Legend**

City of Portland	Major Interceptors
Constrained Opportunity Sites	Sanitary Sewer Pipe
WRDA Project Sites (Water Resource Development Act)	Forcemain
CIP Project Sites (Capital Improvement Projects)	Combined Sewer Pipe
Conceptual Public Storm System Connections	Storm Sewer Pipe
Pump Station	Storm Pressure Main
	Culvert
	Pipes in Poor Condition

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

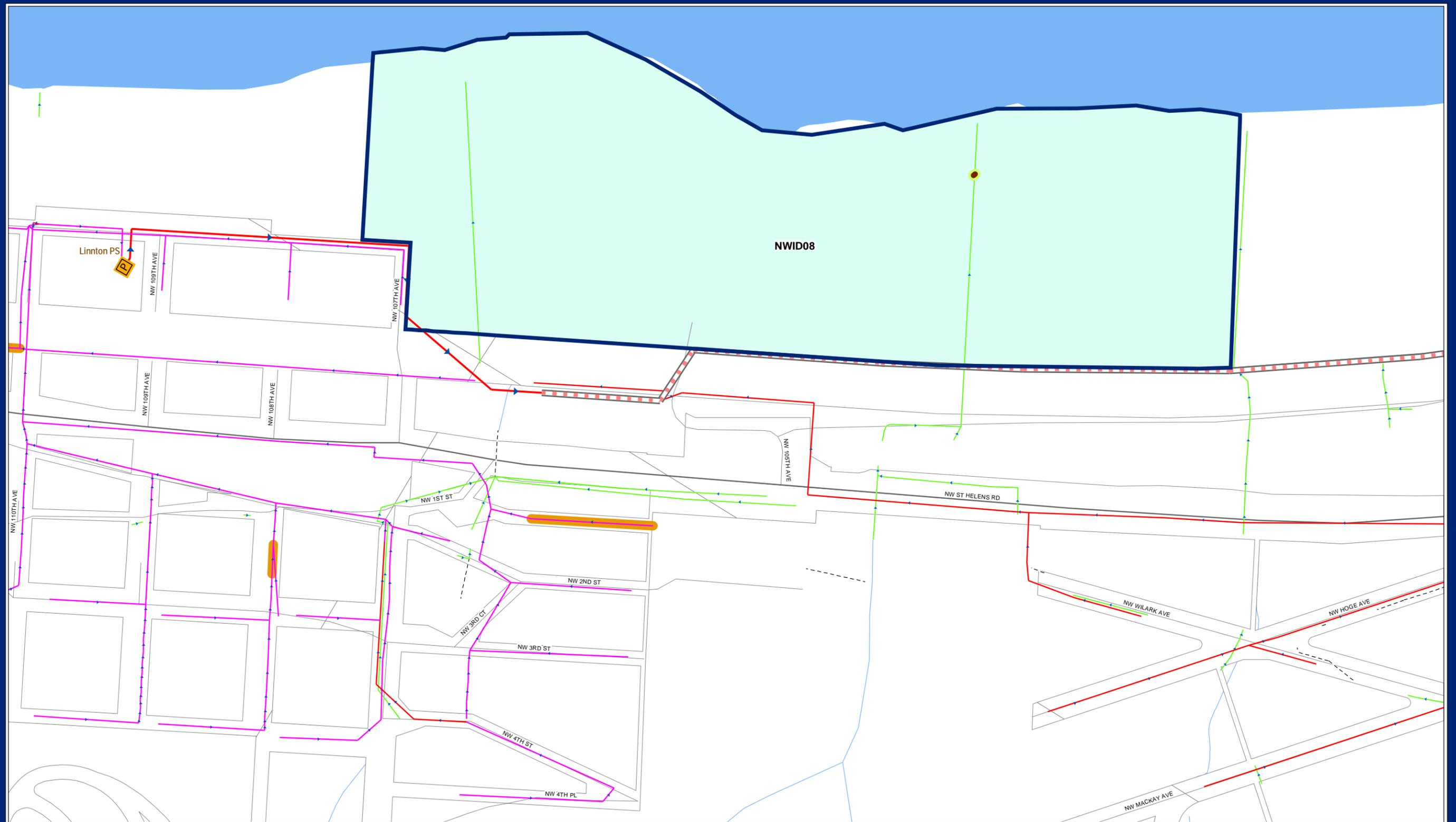
### Sewer Infrastructure Issues in the Vicinity of Opportunity Sites



**Systems Analysis**  
Spatial Analysis and Modeling

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NWID10 2829 NW Yeon Ave

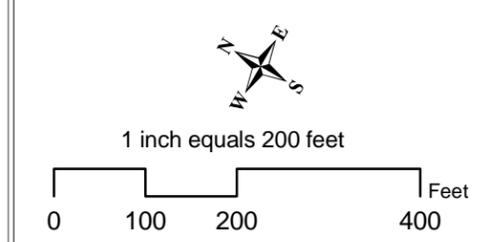
Figure: 3 - 5	Date Printed: 08/31/07
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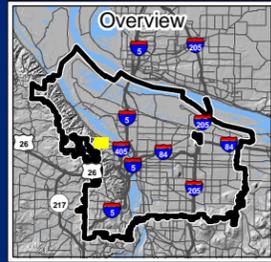
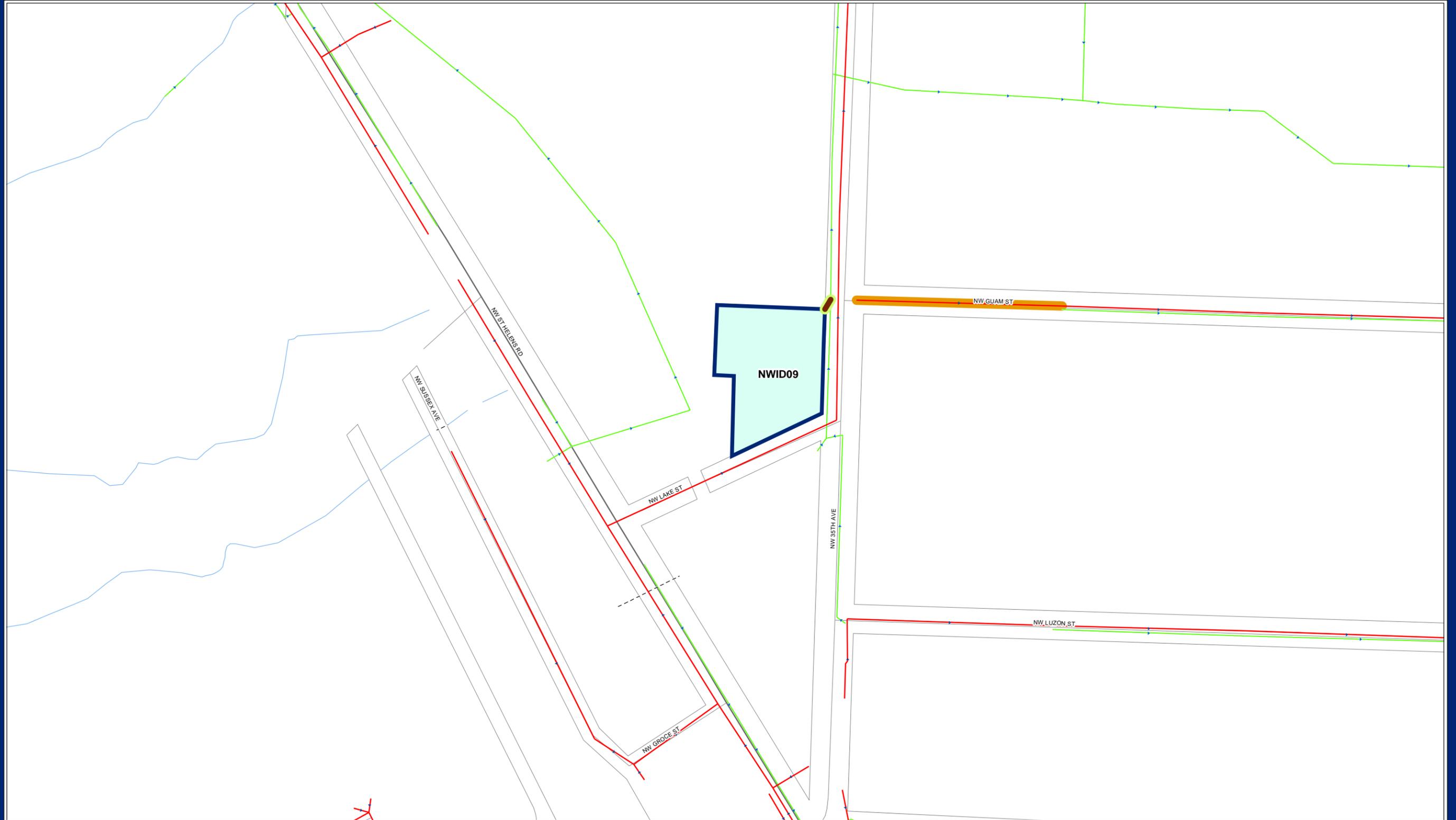
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	City of Portland		Major Interceptors
	Constrained Opportunity Sites		Sanitary Sewer Pipe
	WRDA Project Sites (Water Resource Development Act)		Forcemain
	CIP Project Sites (Capital Improvement Projects)		Combined Sewer Pipe
	Conceptual Public Storm System Connections		Storm Sewer Pipe
	Pump Station		Storm Pressure Main
			Culvert
			Pipes in Poor Condition

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

### Sewer Infrastructure Issues in the Vicinity of Opportunity Sites



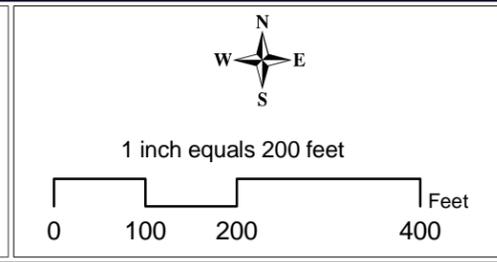
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Figure: 3 - 6	Date Printed: 08/31/07



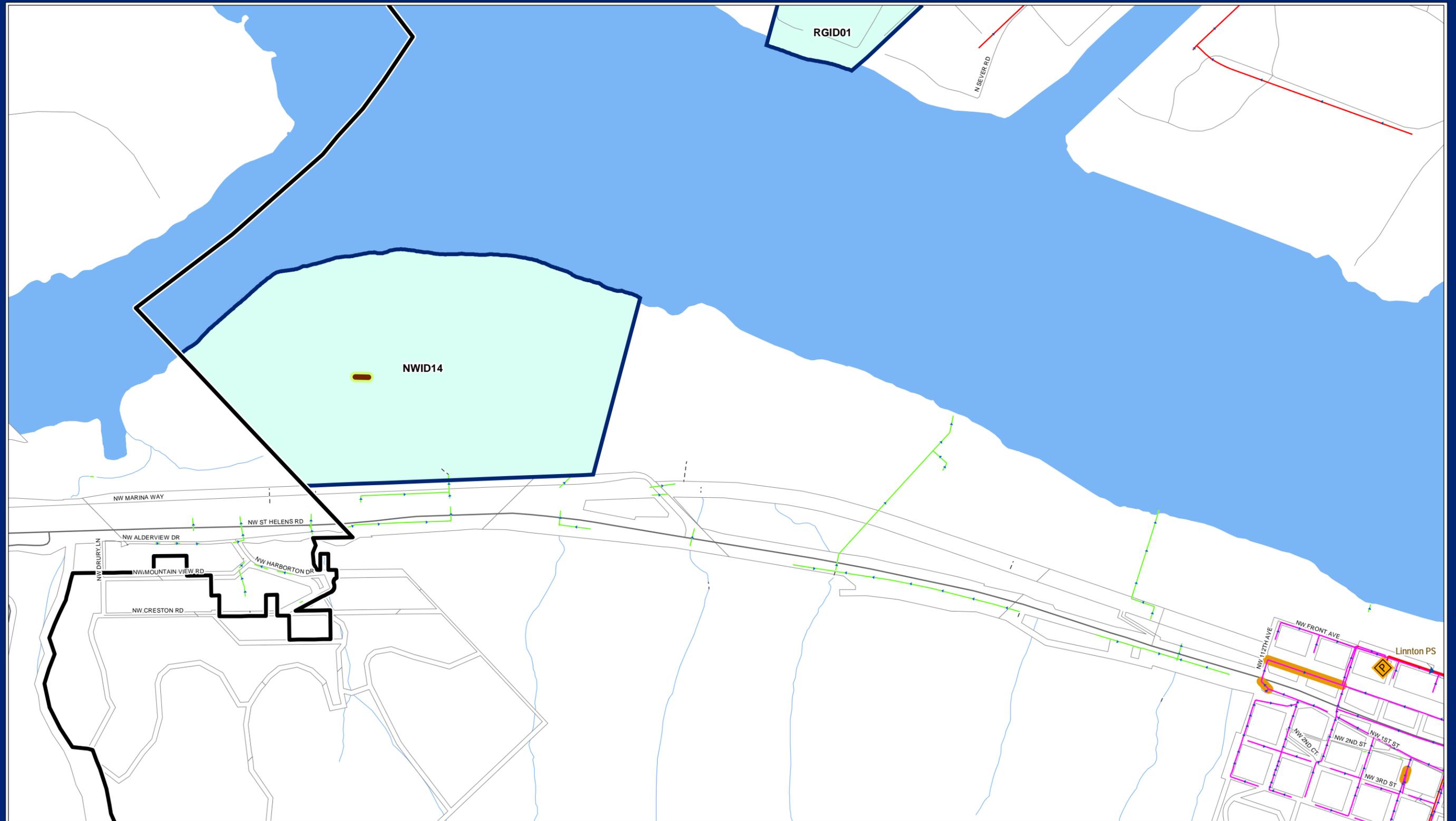
Legend	
	City of Portland
	Constrained Opportunity Sites
	WRDA Project Sites (Water Resource Development Act)
	CIP Project Sites (Capital Improvement Projects)
	Conceptual Public Storm System Connections
	Pump Station
	Major Interceptors
	Sanitary Sewer Pipe
	Forcemain
	Combined Sewer Pipe
	Storm Sewer Pipe
	Storm Pressure Main
	Culvert
	Pipes in Poor Condition

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

### Sewer Infrastructure Issues in the Vicinity of Opportunity Sites



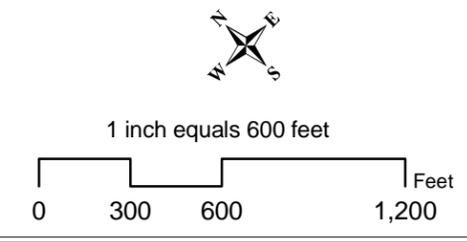
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<i>Figure:</i> 3 - 7	<i>Date Printed:</i> 08/31/07



Legend			
	City of Portland		Major Interceptors
	Constrained Opportunity Sites		Sanitary Sewer Pipe
	WRDA Project Sites (Water Resource Development Act)		Forcemain
	CIP Project Sites (Capital Improvement Projects)		Combined Sewer Pipe
	Conceptual Public Storm System Connections		Storm Sewer Pipe
	Pump Station		Storm Pressure Main
			Culvert
			Pipes in Poor Condition

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

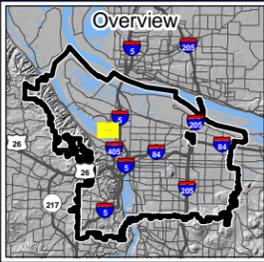
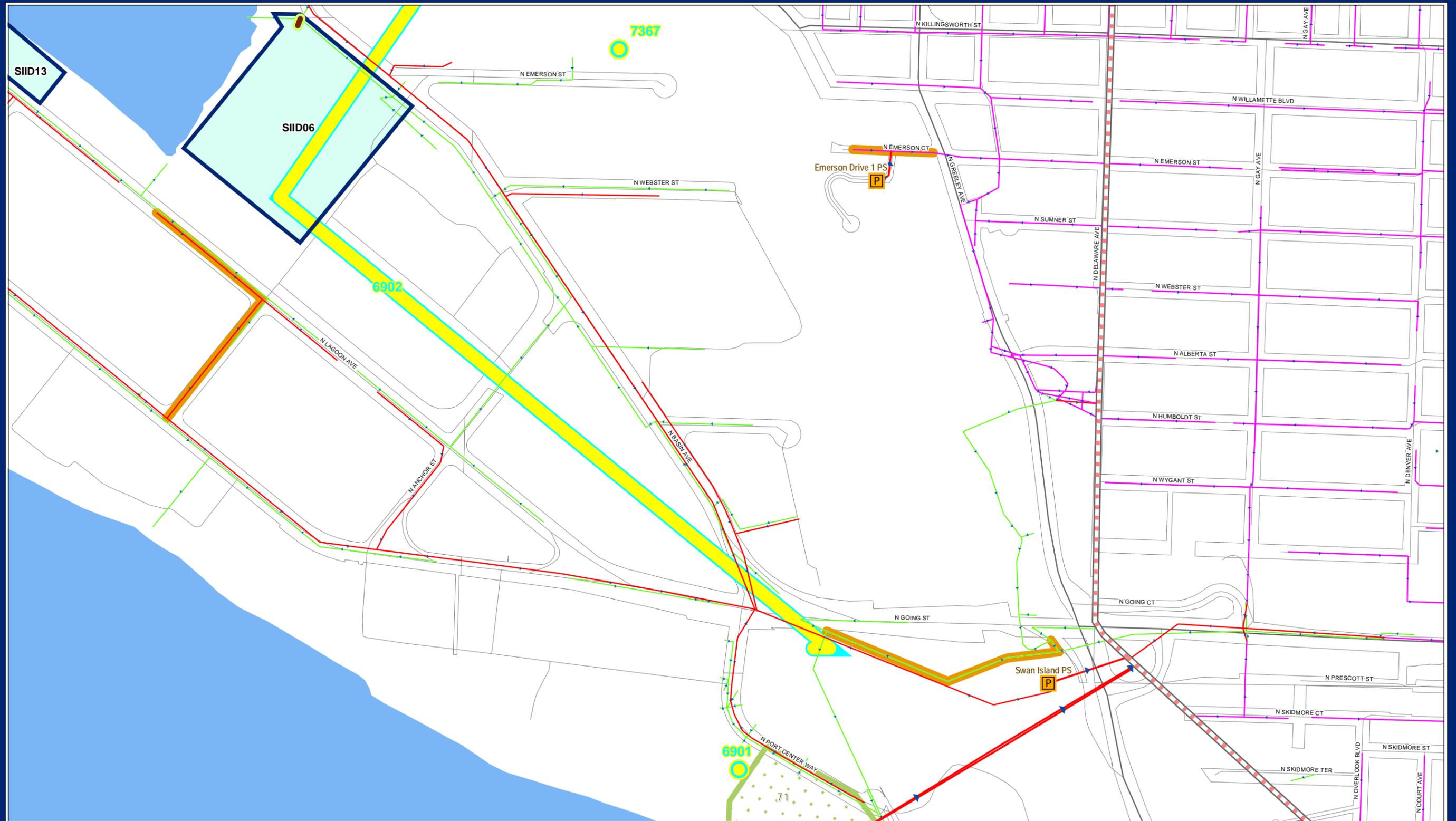
*Sewer Infrastructure Issues in the  
Vicinity of Opportunity Sites*



**CITY OF PORTLAND  
ENVIRONMENTAL SERVICES**  
**Systems Analysis**  
Spatial Analysis and Modeling

<b>Map Type:</b>	
Site View - NWID14 12500 NW Marina Way	
<b>Figure:</b>	<b>Date Printed:</b>
3 - 8	08/31/07

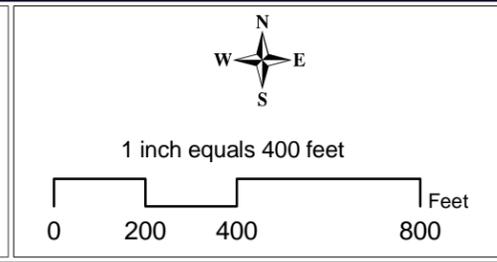
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Legend	
	City of Portland
	Constrained Opportunity Sites
	WRDA Project Sites (Water Resource Development Act)
	CIP Project Sites (Capital Improvement Projects)
	Conceptual Public Storm System Connections
	Pump Station
	Major Interceptors
	Sanitary Sewer Pipe
	Forcemain
	Combined Sewer Pipe
	Storm Sewer Pipe
	Storm Pressure Main
	Culvert
	Pipes in Poor Condition

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

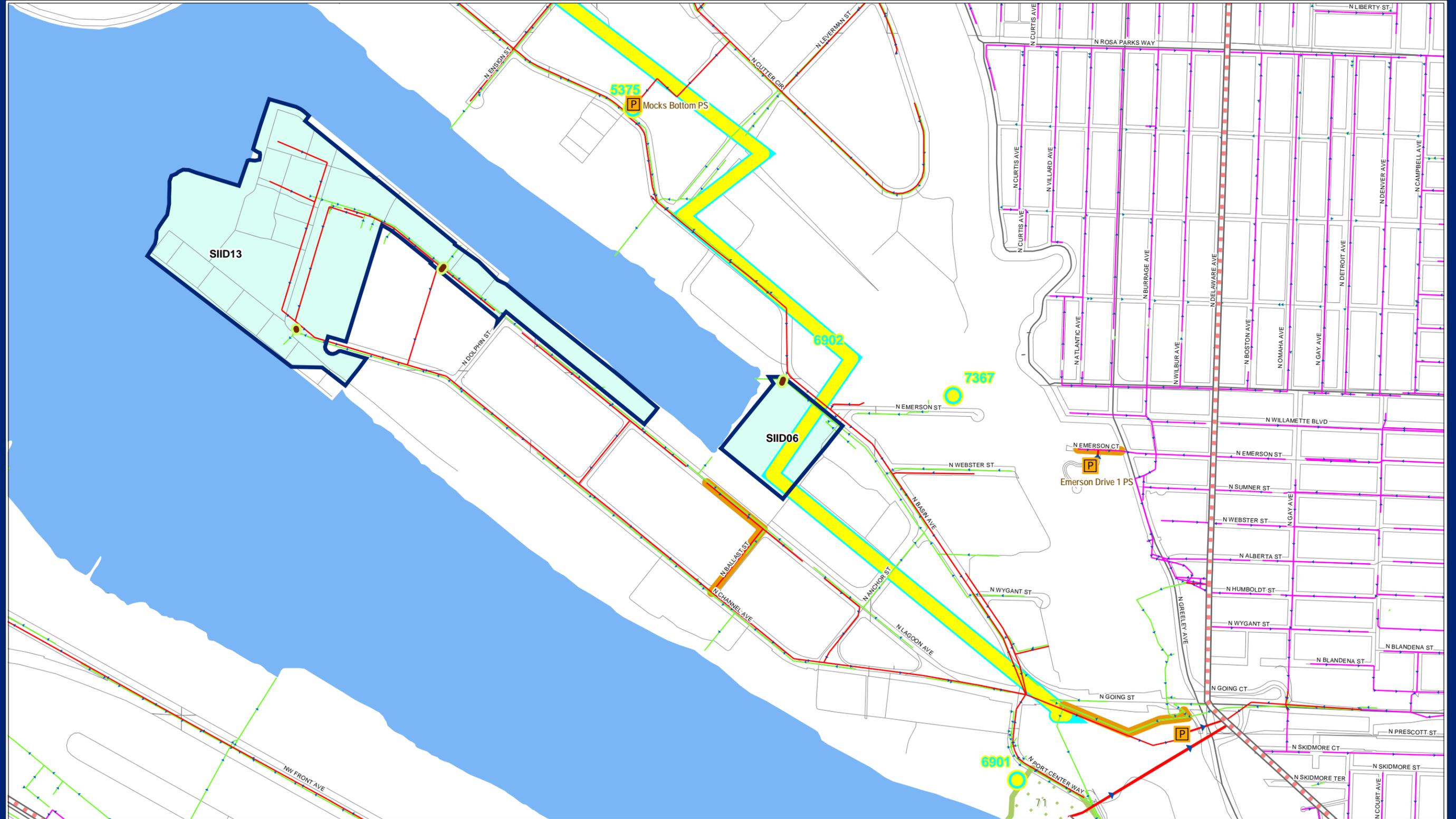
### Sewer Infrastructure Issues in the Vicinity of Opportunity Sites





**CITY OF PORTLAND ENVIRONMENTAL SERVICES**  
Systems Analysis  
Spatial Analysis and Modeling

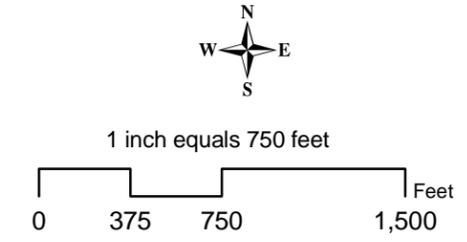
Map Type:	
Site View - SIID06 Basin Ave @ Swan Is. Lagoon	
Figure:	Date Printed:
3 - 9	08/31/07



Legend	
	City of Portland
	Constrained Opportunity Sites
	WRDA Project Sites (Water Resource Development Act)
	CIP Project Sites (Capital Improvement Projects)
	Conceptual Public Storm System Connections
	Pump Station
	Major Interceptors
	Sanitary Sewer Pipe
	Forcemain
	Combined Sewer Pipe
	Storm Sewer Pipe
	Storm Pressure Main
	Culvert
	Pipes in Poor Condition

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

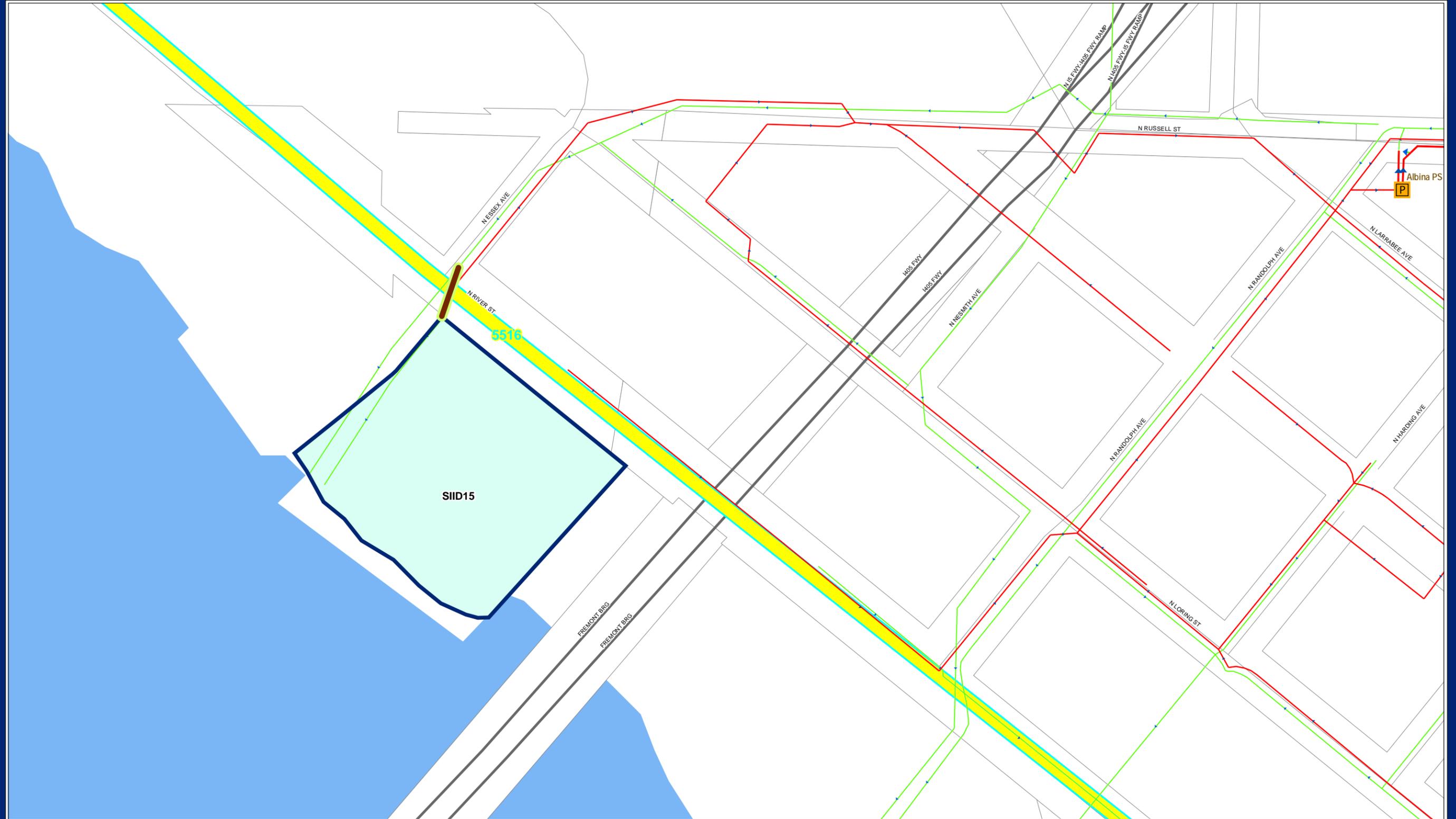
*Sewer Infrastructure Issues in the Vicinity of Opportunity Sites*





**CITY OF PORTLAND ENVIRONMENTAL SERVICES**  
Systems Analysis  
Spatial Analysis and Modeling

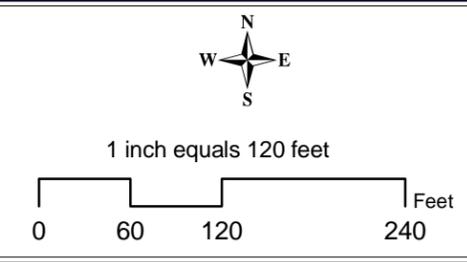
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Figure: 3 - 10	Date Printed: 08/24/07



Legend	
	City of Portland
	Constrained Opportunity Sites
	WRDA Project Sites (Water Resource Development Act)
	CIP Project Sites (Capital Improvement Projects)
	Conceptual Public Storm System Connections
	Pump Station
	Major Interceptors
	Sanitary Sewer Pipe
	Forcemain
	Combined Sewer Pipe
	Storm Sewer Pipe
	Storm Pressure Main
	Culvert
	Pipes in Poor Condition

## Working Harbor Reinvestment Strategy Sanitary Sewer and Stormwater Infrastructure Analysis

*Sewer Infrastructure Issues in the  
Vicinity of Opportunity Sites*



<b>Systems Analysis</b> Spatial Analysis and Modeling	
Map Type: Site View - SIID15 1300 N River St	
Figure: 3 - 11	Date Printed: 08/31/07

## Issues Raised in Business Interviews

Project staff of the Planning Bureau, Port, and PDC conducted interviews with 25 businesses and four focus groups, approximately 60 people. The interviews were selected to reflect a cross section of industries in the harbor districts. Four focus group discussions consisted of industrial developers, industrial real estate brokers, human resource managers, and industrial association representatives. The results of the interviews were summarized in a report that served as the first product of the reinvestment strategy project.

There was no specific sanitary or stormwater infrastructure deficiencies identified in the interview results summary. However, several key stormwater policy issues were raised such as the rate and the rate structure for stormwater fees, as well as the requirements for detention and water quality treatment. Each topic is addressed below.

### Stormwater Rates

*“Our stormwater costs are extremely high” - Business Interview*

Portland’s stormwater costs reflect the accumulated impacts of more than 150 years of urban development on the health of our watersheds. The City has been playing catch-up for the past 30 years, investing hundreds of millions of dollars in facilities to control flooding, improve drainage, remove pollutants and manage billions of gallons of stormwater runoff. Our efforts have been driven by an evolving set of federal and state regulations, and supported by advancements in environmental science and engineering.

Portland’s stormwater charges are high because we have been working to manage urban stormwater runoff longer than other US cities. Portland organized a separate stormwater utility back in 1977 in anticipation of the investments needed to address urban flooding, and comply with the requirements of the federal Clean Water Act, Safe Drinking Water Act, Endangered Species Act, and other environmental laws. We were one of the first cities in the country to confront the dual challenges of combined sewer overflows and stormwater management.

In the coming years, we expect other US cities to catch up to Portland as they come into compliance with federal stormwater regulations and court orders. Cities like Seattle, Tacoma, Cincinnati, Atlanta and Sacramento have combined sanitary and stormwater management charges that are nearly equal to or exceed Portland’s charges.

We are trying to reign in the escalating costs of stormwater management by developing new technologies that meet our regulatory requirements at lower costs, and requiring new and redeveloped properties to manage stormwater runoff on-site. Portland is investing in a sustainable future by attacking the stormwater challenge close to home, promoting the use of “green” stormwater facilities that mimic natural hydrology wherever practical, and requiring on-site stormwater management when properties develop or redevelop. These efforts will reduce the long-term costs of stormwater management and advance our efforts to provide healthy watersheds.

## Stormwater Rate Structure

*“Some businesses are viewing these fees as a tax, because they are not tied to city services. Also, there’s nothing you can do to eliminate or reduce the fee, such as by using pervious paving.” - Business Interview*

Portland’s stormwater charges are calculated based on the amount of measured impervious area on your property. The City uses impervious area as a proxy for calculating your charges because it has been the most cost-effective, equitable and easiest method to administer. The City may propose new methods of charging for stormwater management services as our mapping and billing technologies improve. In the meantime, we have tried to minimize the administrative costs of the utility by relying on the simple and direct approach of measuring impervious area.

Your stormwater bill consists of two charges: on-site stormwater and off-site stormwater. The on-site charge represents 35% of the stormwater utility, and recovers City stormwater management costs attributed to stormwater runoff from private property. The off-site charge represents 65% of the stormwater utility, and recovers City stormwater management costs attributed to the public street system and watersheds.

You have the ability to control both of these charges by reducing the amount of impervious area on your property. In addition, you may control the amount of your on-site stormwater charge by participating in Clean River Rewards, the City’s stormwater discount program. The amount of your on-site stormwater discount is based on the extent and effectiveness of your on-site stormwater management. For complete information about this program, visit our website at [www.CleanRiverRewards.com](http://www.CleanRiverRewards.com).

## Stormwater Detention Requirements

*“We take issue with the stormwater fees and the requirement for retention ponds on sites with limited area. We have to build retention ponds for everyone else’s water while the land down near the river is at a premium.” - Business Interview*

Portland’s Stormwater Management Manual requires detention / retention systems when the soils do not allow infiltration and when discharging into the public system away from the riverbank. Detention is required to ensure there is available capacity for all users during the peak design storm (typically a 10-year storm). If discharging directly to the river or to the city outfall at the riverbank, then detention is not required.

## Stormwater Treatment Requirements

*“After all we did creating a 130-foot wide greenway with bioswales to filter runoff, we’re still paying the same stormwater fee at our facility as the guy down the street who runs a pipe straight into the river.” - Business Interview*

The City's stormwater discount program – Clean River Rewards – provides a number of ways for ratepayers to qualify for on-site stormwater discounts. City Council adopted the program following years of public review and comment. The program reflects existing City stormwater policies and regulations, as well as state and federal permitting requirements. It is true that the program places the same value to direct riparian outfalls to the Willamette River, as is attributed to bioswales and other water quality facilities that discharge to the Willamette River. City Council adopted this particular standard, in response to testimony from the Port of Portland. The Port's testimony highlighted the fact that most riparian ratepayers along the Willamette River must comply with Oregon DEQ stormwater permit requirements governing their stormwater outfalls.



# Planned and Potential Infrastructure Improvements

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## Introduction

As part of its ongoing engineering planning and design process, BES has developed recommended infrastructure improvement projects for the sanitary, combined, and stormwater sewer systems in the study area. Those that have been previously approved are represented in the City of Portland 5-year capital improvements plan (CIP).

BES is currently in the process of preparing a System Plan Update that will incorporate the findings of recent hydrologic and hydraulic modeling of the City's sewer systems and the consequential analyses of potential alternatives to address existing and future system deficiencies. At the end of this engineering planning process it is expected that many of these potential projects will be recommended for funding under the approved 5-year CIP.

In the interim, for the purpose of addressing the few system deficiencies identified in this Working Harbor Reinvestment Strategy analysis, other potential projects specifically related to the development of the targeted Constrained Opportunity Sites, were identified. These potential projects will need to be further evaluated and compared with other alternatives through the engineering planning process before they can be recommended and added to the list of approved 5-year CIP projects.

## Planned Improvements

The locations of City of Portland's Bureau of Environmental Services 5-year capital improvements plan (CIP) projects and Water Resources Development Act projects are depicted in Figure 4-1. These improvements, which have been developed via the BES engineering planning process and recommended for implementation, are also listed in tables inset on Figure 4-1.

## Potential Improvements

The stormwater and sanitary sewer system improvements that would potentially be needed in addition to the existing planned improvements are both shown on Figure 4-1 and listed in Table 4-1. They are also depicted in Figures 4-1 and 3-1 through 3-11. Standard and conventional types of improvements, such as upsizing of pipelines and pump stations, were assumed to help establish conservative planning level estimates for evaluation of the potential development plans. The specific potential improvements are discussed below by system.



**Table 4-1 Potential Improvements and Planning Level Capital Cost Estimates**

Site	Potential Improvement	Planning Level Capital Cost Estimate*
RGID01	Upsize Shipyard Pump Station	\$2,700,000
NWID05	Extend public stormwater sewer pipeline to be within reach of property (15-inch diameter pipe approximately 1,140 feet long)	\$360,000
NWID14	Extend sanitary sewer system 1.1 miles to be within reach of property and increase downstream system capacity	Prohibitive for anticipated number of customers to be served

\*These are preliminary order-of-magnitude capital cost estimates with an expected accuracy of +50/-30 percent. The assumptions for these estimates are detailed in Appendix C. These estimates should be refined during the pre-design and design phases of the projects.

## Sanitary Sewer System

Of the fifteen Constrained Opportunity Sites, only Site RGID01 and NWID14 were found to require sanitary sewer system improvements.

### Site RGID01

As discussed in Chapter 3, the Shipyard Pump Station was identified as having insufficient capacity to handle future condition flows. A potential for future improvements at the Shipyard Pump Station would therefore include increasing the firm capacity (capacity with the largest pump offline) of the pump station to 2,750 gpm.

Increasing the pumping capacity of the Shipyard Pump Station may require replacing the force main. The current force main is 2200 feet long, consisting of 1,238 feet of 12-inch high-density polyethylene (HDPE) pipe, 850 feet of 14-inch HDPE pipe, and 120 feet of 14-inch steel pipe. According to the BES Sewer Design Manual, it is desirable for velocity in a force main to not exceed 10 feet per second (fps), although 8 fps is often considered a practical limit due to increased operating costs at higher velocities. It appears that the 12-inch portion of the force main would be incapable of conveying flows from a 2,750-gpm pump station within this range, and that this portion of the force main would likely require upsizing. It may be sufficient to replace the 12-inch portion of the force main with 14-inch diameter, generating velocity in the force main of 5.7 fps.

### Site NWID14

The nearest public sanitary sewer connection for the PGE site is the Linnton system located approximately one mile away. To serve this area with a full public sanitary system would require:

- 70 to 350 gpm pump station
- Minimum diameter (4-inch) force main approximately 1.1 miles long
- Possible upgrade to Linnton Pump Station to convey additional sewage to Guilds Lake Pump Station

The cost to implement this type of sanitary system for the small number of potential customers renders it impractical and economically infeasible.

Development of the PGE site for heavy industrial/manufacturing uses would require on-site management of both sanitary wastes and industrial wastes. Management of industrial wastes will be specific to the type of industrial manufacturing process to be implemented at this site. Because it is not possible at this time to know what that industrial process may be, it is assumed for the purposes of this analysis that the process waste treatment needs will be incorporated into the design and implementation of the manufacturing process and will not be addressed further in this report.

There are three options for the onsite management of typical sanitary waste:

- Onsite treatment of Small Flows
- Onsite storage of Small Flows with frequent pump-out and removal via septage hauler service
- Onsite treatment and discharge via NPDES permit for Large Flows

**Option 1: Onsite Treatment of Small Flows**

This option assumes that the site generates a small amount of sanitary waste and that the land conditions allow for a septic and sand filter system. This will be the most cost-effective approach for sanitary service for this site assuming that the demand can be accommodated by an onsite system. The sizing requirements are directly tied to the number of employees being served which is unknown at this time.

For more information:

- Bureau of Development Services: (503) 823-7300; [www.portlandonline.com/bds](http://www.portlandonline.com/bds) for information and Sanitation Permit Application

**Option 2: Onsite Storage of Small Flows**

This option assumes that the site is not capable of sustaining a septic / sand filter system but still generates a small amount of sanitary waste (less than 1,000 gallons per day), which could be stored on-site in a septage tank. Either daily or several times per week the septage could be pumped out into a septage truck and hauled to the treatment plant. DEQ requires a Water Pollution Control Facility (WPCF) permit for Interim Septage Storage Tanks. This permit requires septage storage tanks to be a minimum of 1,500 gallons in size.

For more information:

- Orenco Systems in Sutherlin, Oregon manufactures 1,500-gallon fiberglass tanks for on-site septage storage.
- Local septage haulers include MRP (Metro Rooter & Plumbing) and A All Pump Sanitary Services.
- Bureau of Development Services: (503) 823-7300; [www.portlandonline.com/bds](http://www.portlandonline.com/bds) for information and Sanitation Permit Application
- Oregon DEQ WPCF Permits: <http://www.deq.state.or.us/WQ/wqpermit/permits.htm>

**Option 3: Onsite Treatment of Large Flows**

This option assumes that the site generates from 70 to 350 gallons per minute of sanitary waste than could be treated using a package treatment plant such as a membrane bio-reactor (MBR) system. This type of system can treat normal sanitary waste along with potential low-strength organic waste that did not possess chemicals corrosive to the membrane system. Costs were obtained from a local vendor (WH Reilly & Co.) for three different sized systems:

- 70 gallons per minute: \$1.5 million
- 140 gallons per minute: \$ 2.0 million
- 350 gallons per minute: \$2.5 million

Costs provided here include \$250,000 for onsite piping and 50 percent design/contingency. The outfall to the Willamette River (or Multnomah Channel) would need to be permitted by DEQ and the Corps of Engineers.

In contrast, the costs to build a pump station and a mile-long forcemain to direct sanitary flow to the Linnton sewer system, along with upgrades of that system to convey the additional flow, would likely be ten times these costs.

**Combined Sewer System**

The combined sewer system analysis concluded that no improvements are needed to accommodate the Constrained Opportunity Sites.

**Stormwater Sewer System**

Based on the analyses described in Table 3-2, it was determined that the existing stormwater sewer system has sufficient capacity to accommodate stormwater flows from all fifteen of the Constrained Opportunity Sites. All of the sites, however, will need to connect to the stormwater system via on-site laterals. The potential stormwater lateral locations are shown on Figures 3-1 through 3-11. The actual configurations of the laterals may differ from the conceptual layouts shown in these figures. The anticipated characteristics of these laterals are summarized in Table 4-2. Of all the stormwater connections, only the one for Site NWID05 will require extension of the public stormwater collection system.

**Table 4-2 Potential Stormwater System Connections**

Site ID	Potential Stormwater System Connections*
<b>Rivergate Subdistrict</b>	
RGID01	145-foot connection to existing ditch. Ultimate outfall is on Columbia Slough (AAA538). Assumes ditch has adequate capacity to convey flow to outfall. Estimated 10-year peak flow is 43 cfs.
RGID02	85-foot connection pipe to nearest storm drainage pipe with appropriate capacity (36 inches). Drains to OF 52A. Estimated 10-year peak flow is 12 cfs.

Site ID	Potential Stormwater System Connections*
RGID12	60-foot connection pipe for one of two pipes needed to connect site to two distinct outfalls. Both outfalls needed for adequate capacity. Estimated 10-year peak flow is 21 cfs.
<b>Northwest Subdistrict</b>	
NWID03	100-foot private lateral to existing stormwater pipe (OF-22B). Estimated 10-year peak flow is 56 cfs.
NWID04	50-foot connection pipe to existing stormwater pipe (OF-22B) with adequate capacity for future development. May be combined with other line from adjoining site (NWID05). Estimated 10-year peak flow is 10 cfs.
NWID05	1,140-foot connection pipe along current street alignment to storm pipe with appropriate capacity (OF-22B). Existing pipe along this alignment is not adequate for future development at this site. Estimated 10-year peak flow is 8 cfs.
NWID07	15-foot connection pipe to existing 102-inch storm pipe to Outfall AAX560. Capacity fine given timing of potential tunnel overflow versus site discharge for a large storm event. Estimated 10-year peak flow is 15 cfs.
NWID08	4-foot connection pipe to exiting 60-inch private storm pipe currently on property. Estimated 10-year peak flow is 20 cfs.
NWID09	Connection pipe to existing storm pipe with appropriate capacity. Site currently drains to this same drainage pipe, but due to size of site any extra development should have minimal impact on capacity here.
NWID10	Capacity constraints downstream of this site require that the flow from future development be divided into two separate stormwater pipes. One 55-foot connection pipe will drain to an existing 18-inch stormwater line to the north of the site, while another 32-foot connection pipe will drain to an existing 27-inch stormwater line to the south of the site.
NWID11	15-foot connection pipe to existing 84-inch storm pipe with appropriate capacity. Estimated 10-year peak flow is 25 cfs.
NWID14	Connection to existing on-site wetlands. Assumes flow will first enter wetlands before discharge to the river/slough.
<b>Swan Island Subdistrict</b>	
SIID06	30-foot connection pipe to existing 60 -inch storm line currently running across the site. Estimated 10-year peak flow is 10 cfs.
SIID13	15-foot connection pipe to existing line to outfall OFS-6. Conveyance all on site currently. Most site flow needs to go here due to capacity constraints. Estimated 10-year peak flow is 23 cfs.
SIID15	Connection to nearest pipe with known available capacity (Outfall ABC079). Nearer pipe may be better, but data currently limited or contradictory.

\*The connections described are conceptual. Actual configurations may differ from those assumed for conceptual assessments. For example, the configurations will depend on site development layouts and inlet locations.

# Prioritization of Improvements

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Only two potential public infrastructure improvements were identified as part of this infrastructure analysis for the Working Harbor Reinvestment Strategy Constrained Opportunity Sites:

- Upsize Shipyard Pump Station to accommodate sanitary flows from RGID01 and other sites in the area.
- Extend existing stormwater sewer pipeline approximately 1,140 feet to the NWID05 site to provide point of connection.

With so few projects to consider, it was unnecessary to rank the improvements by priority in order to select which ones to carry forward for further evaluation in the engineering planning process. Both are recommended for further evaluation.



## CHAPTER 6

# References

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**APPENDIX A**

# **Stormwater Analysis Information**

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APPENDIX A

# Stormwater Analysis Information

Information gathered as part of the stormwater infrastructure analysis is summarized in Table A-1. This includes site information, modeling notes, and preliminary results. This information is provided to document initial modeling assumptions about the sites and to serve as a resource for more detailed future follow-up analyses.

TABLE A-1  
Stormwater Infrastructure Analysis Information

Site	Site Information	Stormwater System Capacity Analysis Notes and Results
<b>Rivergate Subdistrict</b>		
RGID01	<p>About 80 percent of this site consists of grassy fields. Another 10 percent supports about 20 large tanks. The rest is bare dirt and buildings.</p> <p>No existing storm sewer was identified inside the site boundary. All existing sewers/ditch system drain away from the site towards east to the North Slough. There is a roadside ditch along N. Time Oil Rd.</p>	<p>Assumed runoff from future development will be discharged to the road site ditch along N. Time Oil Rd. The ditch eventually discharges to MS4 outfall AAA538 (a 60-inch pipe). Based on MS4 delineation, existing capacity of the 60-inch pipe will be reviewed to evaluate if there is extra room available for runoff from future developments on-site. XP-SWMM was used to estimate runoff.</p> <p>The 60-inch outfall pipe (MS4 AAA538) appears to have adequate capacity to accommodate 10-year peak flow from future developments. Since no information was available about the roadside ditch, capacity check was not performed.</p>
RGID02	<p>This lot is primarily paved or graveled, sloping SW to the Willamette. Trees and shrubs cover the SW and S corners.</p> <p>There is an existing 36-inch storm pipe located just north of the site. MS4 delineation is available for this stormwater outfall.</p>	<p>Used Rational Method to estimate 10-year peak flow from the site for future development. The capacity of the 36-inch pipe was evaluated using Manning's equation. The existing 10-year peak flow was estimated using the Rational Method.</p> <p>The 36-inch pipe outfall (MS4 Willamette OF52A) appears to have adequate capacity to accommodate peak flow from the site under 10-year storm.</p>
RGID12	<p>About half of this site is vegetated and half is impermeable. Vegetated areas include the NW portion and the area north of N. Marine Dr. Impermeable areas include a street, parking area, and buildings.</p> <p>This site is located between Smith Lake and Columbia River. There are existing storm sewers (pipe and open ditch) on-site. Capacity of the sewer pipe needs to be checked to see if it can convey extra flow from the new development.</p>	<p>The site can be divided based on location of existing outfalls. Capacity of the outfalls and flow they are currently carrying can be estimated based on MS4 outfall delineation. Estimated peak discharge from the site under future condition and identified if there is any capacity deficiency. Rational Method was used.</p> <p>Runoff from future development can be split and discharged to two existing storm sewer systems along N. Marine Drive (MS4 outfalls AAA672 and AAA673). The two outfall pipes appear to have adequate capacity if working together to accommodate runoff from future developments.</p>

TABLE A-1  
Stormwater Infrastructure Analysis Information

Site	Site Information	Stormwater System Capacity Analysis Notes and Results
<b>Northwest Subdistrict</b>		
NWID03	<p>The larger portion of this site is primarily bare earth and concrete building pad with about 15 percent vegetated in shrubs to the NW. There is an existing storm sewer system in the vicinity that might be able to carry additional runoff from future development.</p> <p>The northwestern portion of the site partially under the bridge is primarily vegetated in shrubs, with a small pump station and parking lot at the south end. There are existing storm sewer pipes along south boundary.</p>	<p>XP-SWMM model results indicate that runoff from future developments at these sites can be discharged into the existing sewer pipeline along NW Front Avenue to MS4 outfall AAJ638 (or MS4 outfall OF22B) without causing significant surcharge problems in the existing system. The outfall pipe is assumed to receive sanitary overflow from Guilds Lake Pump Station. Based on sanitary analysis, the pump station has adequate capacity and will not spill into the storm system under 10-year event. Therefore, no flow from Guilds Lake Pump Station is assumed. There is also an existing storm sewer along NW 61st Avenue and eventually discharges to outfall AAM088. XP-SWMM model results indicate there is no extra capacity in this sewer line to accommodate flow from future developments at the site.</p>
NWID04	<p>This level lot is entirely vegetated with grass and few shrubs. There are existing storm sewer system in the vicinity that might be able to carry additional runoff from future development. MS4 delineation available for the site. If pipe size/inverts information available, capacity can be estimated to evaluate the extra loading.</p>	<p>XP-SWMM model results indicate that runoff from future developments at these sites can be discharged into the existing sewer pipe line along NW Front Avenue to MS4 outfall AAJ638 (or MS4 outfall OF22B) without causing significant surcharge problems in the existing system. The outfall pipe is assumed to receive sanitary overflow from Guilds Lake Pump Station. Based on sanitary analysis, the pump station has adequate capacity and will not spill into the storm system under 10-year event. Therefore, no flow from Guilds Lake PS is assumed. There is also an existing storm sewer along NW 61st Avenue and eventually discharges to outfall AAM088. XP-SWMM model results indicate there is no extra capacity in this sewer line to accommodate flow from future developments at the site.</p>

TABLE A-1  
Stormwater Infrastructure Analysis Information

Site	Site Information	Stormwater System Capacity Analysis Notes and Results
NWID05	<p>The site is split into two portions: 8.6 acres and 7.5 acres.</p> <p>In the 8.6-acre portion, about 90 percent of this level site is covered in grass or bare earth, the rest is paved and supports 7 tanks. There is an existing storm sewer system in the vicinity that might be able to carry additional runoff from future development. MS4 delineation available for the site. If pipe size/inverts information available, capacity can be estimated to evaluate the extra loading.</p> <p>In the 7.5-acre portion, this lot is about 75 percent impermeable with pavement and buildings. The rest is grassy. There is an existing storm sewer system in the vicinity that might be able to carry additional runoff from future development. MS4 delineation available for the site. If pipe size/inverts information available, capacity can be estimated to evaluate the extra loading.</p>	<p>XP-SWMM model results indicate that runoff from future developments at these sites can be discharged into the existing sewer pipeline along NW Front Avenue to MS4 outfall AAJ638 (or MS4 outfall OF22B) without causing significant surcharge problems in the existing system. The outfall pipe is assumed to receive sanitary overflow from Guilds Lake Pump Station. Based on sanitary analysis, the pump station has adequate capacity and will not spill into the storm system under 10-year event. Therefore, no flow from Guilds Lake PS is assumed. There is also an existing storm sewer along NW 61st Avenue and eventually discharges to outfall AAM088. XP-SWMM model results indicate there is no extra capacity in this sewer line to accommodate flow from future developments at the site.</p>
NWID07	<p>The entire level lot is paved, graveled, or supports buildings.</p> <p>This site is almost 100 percent impervious. This site could discharge to the 102-inch pipe along west perimeter of the site. No MS4 delineation was done for this outfall.</p>	<p>Used Rational Method to estimate 10-year peak flow from the site for future condition.</p> <p>The 102-inch pipe outfall should have adequate capacity to accommodate peak flow from future development at the site for the following reasons: (1) The timing of the peak due to the outfall mainly receives overflow from Nicolai Shaft which takes a relatively long time to fill up the tunnel before overflow occurs. (2) Ratio of the 10-year peak flow from the site versus capacity of the 102-inch pipe.</p>
NWID08	<p>The NW half of this site is paved with buildings, and the SE half is a mixture of bare earth, with vegetated boundaries to two ponds and the shore.</p> <p>There are three private storm sewers (one unknown size running across the site at west side, one 60-inch running across in the middle of the site and collects flow from an unknown stream, and one 36-inch along east boundary of the site) nearby that discharge to the Willamette River. Runoff from future developments may be able to be conveyed by these two existing sewer pipes.</p>	<p>Since three outfalls are private outfalls, not quite sure if runoff from future development can be discharged into them. Only estimated the 10-year peak flow from future development on-site and compared with the full capacity of the 60-inch pipe.</p> <p>10-year peak flow from future development at this site is approximately 10 percent of the total capacity the 60-inch pipe outfall. Considering the difference in timing of the peak, the 60-inch pipe might be able to accommodate the peak flow from future development at the site.</p>

TABLE A-1  
Stormwater Infrastructure Analysis Information

Site	Site Information	Stormwater System Capacity Analysis Notes and Results
NWID09	<p>About 40 percent of this small, level lot supports buildings, 40 percent is bare grass, and less than 20 percent is covered in shrubs with a few small trees.</p> <p>This site is located at the upstream end of an existing storm sewer with an MS4 delineation of 103 acres. Due to the small size of the site and current impervious percentage, a simple flow ratio estimate could be performed to estimate impact of the future development at the site.</p>	<p>Used Rational Method to estimate 10-year peak flow from the site for future condition. With the current impervious percentage and future flow reduction requirements by SWMM, the site is unlikely to have capacity deficiencies unless there are problems now.</p> <p>Given the size of the site, and the fact that it is currently 75 percent impervious and discharges to existing sewer system along NW 35th Ave., the incremental flow from future development at this site is considered insignificant compared to the minimum size of the existing collection system (i.e., 24-inch). It is safe to assume that any incremental flow from future development can be conveyed by the existing storm pipe along NW 35th Ave.</p>
NWID10	<p>This level lot is entirely covered in lawn with one tree.</p> <p>There are existing storm sewers along perimeter of the site. MS4 delineation is done for the pipe system along north portion of the site. However, since the site is located at the US end of the system, capacity of the entire storm pipe network needs to be checked to ensure adequate capacity. There is also existing sewer pipe located at east portion of the site. No MS4 delineation is performed for this system. Again, the site is located at relatively US of the system.</p>	<p>Used XP-SWMM model to estimate 10-year peak flow from the site for future condition.</p> <p>If all of the site runoff is sent to the existing 12-inch storm sewer along NW Yeon Ave. to MS4 outfall 16, some storm pipe segments in the existing sewer system will experience surcharge problems because of increased flow from the site. Therefore, it is likely that the site runoff would be split, sending a portion of future flow to another 27-inch to 30-inch existing storm sewer along NW Nicolai Street, which eventually goes to the 102-inch outfall pipe. Site NWID07 will also send future flow to this outfall.</p>
NWID11	<p>This site is about half vegetated and half impermeable. The vegetated half includes fairly level fields of grass and shrubs with some small trees. Impermeable areas include roads, paved lots, and buildings.</p> <p>There is an existing 84-inch storm pipe along east boundary of the site. The existing storm sewer collects significant drainage area including drainage area for the Dianne Creek. Runoff from future new developments can be carried by existing pipe. Due to existing storm drainage area size, a percentage of flow estimate for the site versus outfall pipe capacity might be adequate.</p>	<p>Used XP-SWMM to estimate 10-year peak flow from the site for future condition. Estimated capacity of the 84-inch pipe outfall and performed a scale analysis.</p> <p>10-year peak flow from future development at this site is less than 10 percent of the total capacity the 84-inch pipe outfall. Considering the difference in timing of the peak, the 84-inch pipe might be able to accommodate the peak flow from future development at the site.</p>

TABLE A-1  
Stormwater Infrastructure Analysis Information

Site	Site Information	Stormwater System Capacity Analysis Notes and Results
NWID14	<p>More than half this site is vegetated, primarily in the NW, but also to the SW. Vegetation includes grass, shrubs, and trees, possibly with a creek or wetland. 25 to 40 percent is impermeable, primarily paved with small structures and two large tanks.</p> <p>There is a wetland located in the SW corner of the site. A 30-inch culvert and a roadside ditch carry runoff from upstream basins and discharge into the wetland. The wetland outlet appears to be an open ditch that eventually merges with Miller Creek and then discharges to the Willamette River. The wetland can potentially receive runoff from future developments located at west portion of the site. There is an unknown sized culvert that carries runoff from portions of NW Marina Way and NW St Helens Road to the site. There is also an 18-inch private culvert discharging to a low point at SE corner of the site (green space for now).</p>	<p>Assumed runoff from future development will be discharged to the wetland. No calculation was performed for this site.</p> <p>No capacity check is performed for this site. Runoff from future development is assumed to discharge to the wetland first before it discharges to the river.</p>
<b>Swan Island Subdistrict</b>		
SIID06	<p>This level lot slopes steeply to the Willamette at the NW edge. Nearly 90 percent is bare grass, and more than 10 percent is paved roads and parking lot.</p> <p>There is a 60-inch storm sewer line along north boundary of the site, which eventually discharges into the Willamette. MS4 delineation is available for the outfall. Runoff from future developments at the site could be discharged into the 60-inch pipe after checking the capacity of existing pipe.</p>	<p>Used Rational Method to estimate 10-year peak flow from the site for future condition. The capacity of the 60-inch pipe was estimated using Manning's equation. XP-SWMM was used to estimate the 10-year peak flow.</p> <p>The 60-inch outfall pipe (MS4 OFM-3) appears to have adequate capacity to accommodate 10-year peak flow from future development at the site.</p>
SIID13	<p>This entire lot is impermeable with roads, parking lots, buildings, and 8 large storage tanks.</p> <p>There are existing storm sewers on-site. MS4 delineations are done for identified outfalls on site. Runoff from future developments at the site could split and discharge into two outfalls at the site. Capacity of existing sewer pipe can be evaluated.</p>	<p>Divided the site based on the location of existing outfalls. Estimated peak flow for each piece of the lot. Identified extra capacity of each outfall and evaluated if the existing system has adequate capacity to carry the runoff from future developments using Rational Method. Checked capacity only at outfall pipes.</p> <p>The two existing MS outfalls on-site (Willamette OFS-6 and OFS-1) appear to have adequate capacity to accommodate flow from future development at the site. The future runoff can be split and sent to two pipe outfalls. Outfall OFS-6 has more capacity than OFS-01.</p>

TABLE A-1  
Stormwater Infrastructure Analysis Information

Site	Site Information	Stormwater System Capacity Analysis Notes and Results
SIID15	<p>Nearly this entire lot is one large building.</p> <p>This site is 100 percent impervious now. There are parallel storm sewers (27-inch and 36-inch) at west side of the site. MS4 delineation is done for the 27-inch outfall.</p>	<p>Used Rational Method to estimate 10-year peak flow from the site for future condition. Estimated peak flow for the 27-inch outfall drainage area and compared with the capacity of the 27-inch to see if there is extra capacity available.</p> <p>The 27-inch BES outfall pipe (MS4 OF45) has adequate capacity to accommodate runoff from future development from the site. The capacity of the 36-inch pipe outfall was not reviewed because its drainage area is not clearly defined.</p>

**APPENDIX B**  
**City of Portland Sewer Fee Code**

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# City Code for Sewer Fees Applied to Properties Within the City of Portland

## 17.36.010 Sewer User Service Charges. - Printable Version

(Amended by Ordinance Nos. 159797, 161643, 163001, 164262, 165135, 165622, 166574, 166778, 168893, 169940, 170198, 170717, 173367, 174178, 174508 and 174615, effective June 30, 2000.) Sewer user service charges, as authorized by the Charter, are established and made effective as follows:

**A. Charges for Sanitary Sewer Services.** Except as otherwise provided by this Title, sewer user service charges shall be paid by all sanitary sewage customers who cause or permit the discharge of sanitary sewage from a property in their possession into sewage facilities owned or maintained by the City. The charges shall begin upon connection. Charges for sanitary sewer services include sanitary sewer volume charges, account service charges and penalties for non-payment or late-payment of sewer charges and may include other charges as provided for in this Chapter.

**1. Dwelling units.** Charges for dwelling units shall be based on the volume of sewage discharge to the sanitary sewer system. When discharge meter readings are not available, the Bureau may elect to use the water meter consumption as the calculation for the sanitary sewage discharge. To avoid including irrigation water usage in this calculation, the Bureau will establish a procedure that allows for irrigation credit. When a water meter reading is not available, a sanitary sewer discharge estimate shall be made based on the customer class of characteristics as determined by the Director. The sewer user rates for dwellings are shown in [Figure 3](#) published at the end of this Title.

**2. Commercial, industrial and all occupancies other than residential.** The calculation of the charges for commercial, industrial and all occupancies other than residential shall be based on the amount of incoming water volume as measured by the City water meter or information from the water district serving the property or by a Bureau approved meter that measures actual discharge volume. Discharge meters must meet the current standards for such meters as described by the Director. To establish reduced charges or credit for water not subject to sewer charges, customers must comply with the requirements in Section 17.36.040 "Special Provisions." If a sewer customer does not have a City meter or water district meter measuring the supply of water to the property, the private water supply must be metered in accordance with Section 17.36.040. In areas served by separated storm and sanitary sewer systems, the City may accept the discharge of contaminated stormwater into the sanitary sewer. The discharge volumes will be based upon the impervious area producing the contaminated stormwater and the average rainfall or a discharge meter. The discharge will be charged sanitary sewer volume rates. The sewer user rates for commercial, industrial and occupancies other than residential are as shown in [Figure 3](#) at the end of this Title.

**3. Combined dwelling units and other.** Where dwelling units and other occupancies are combined on the same water supply, the charges for sanitary sewage service shall be computed in the same manner as those for commercial, industrial and all occupancies other than residential.

**B. Charges for drainage services.** Except as otherwise provided by this Title, drainage service charges shown in [Figure 3](#) shall be paid by all drainage service customers who benefit from stormwater drainage system services or drainage facilities owned or maintained by the City. The Water account customer is assumed to be the drainage service customer for the purposes of drainage services. If there is no Water account customer, the Bureau of Environmental Services shall determine the drainage service customer.

**1. Basis for charge.** Drainage fees shall be charged based on each drainage service customer's proportionate share of stormwater drainage system services. For administrative purposes, the

user's proportionate share will be assumed to be perfectly correlated with the amount of impervious area on the user's site. Unless the Bureau of Environmental Services measures actual site characteristics, impervious area shall be assumed to be the average impervious area for the customer's class as shown in the most recent rate study.

**2. Dwelling units.** Unless the City chooses to measure the actual amount of impervious area on a site in the drainage service customer's possession, the City shall assume average dwelling unit characteristics, including impervious area, for each class of dwelling unit. The averages used shall be 2,400 square feet for one or two dwelling units, 3,000 square feet for three dwelling units, and 4,000 square feet for 4 dwelling units. Impervious area for buildings with 5 or more dwelling units shall be measured. The charge per 1000 square feet of impervious area is shown in [Figure 3](#).

**3. Properties other than dwelling units.** The drainage service customer's proportionate share of stormwater drainage system services shall be calculated based on the amount of impervious area on that site rounded to the nearest 1000 square feet, and calculated as a multiple of the charge for 1000 square feet of impervious area that is shown in [Figure 3](#).

**4. Drainage Districts.** Payments from Multnomah Drainage District No. 1, Peninsula Drainage District No. 1, and Peninsula Drainage District No. 2 under an Intergovernmental Agreement will constitute payment of monthly stormwater charges by properties within the boundaries of the districts, for purposes of this section.

**TITLE 17  
PUBLIC IMPROVEMENTS**

**SEWER USER SERVICE CHARGES AND RATES**

FIGURE 3 - (Section 17.36.010)  
(Replaced by Ordinance No. 181006,  
effective July 1, 2007.)

	Effective Date 7/1/2007
<b>RESIDENTIAL DWELLINGS</b>	
SEWER SERVICE of Water Consumption	Rate Per 100 Cubic Feet
Sanitary Sewage Volume Rate	\$5.70
	Rate Per 1,000 Square Feet Per month
Impervious Area	\$7.22
Low Income Discount	Discount Per Month
Eligible Customers Only	\$18.22
<b>COMMERCIAL &amp; INDUSTRIAL</b>	
Special Meter Charge	Flat Charge Per Special Meter per Bill \$21.75
Sanitary Sewage Volume Rate	Rate Per 100 Cubic Feet of Water Consumption \$5.864
Clean Water discharged to a storm sewer not connected to a combined sewer	Rate Per 100 Cubic Feet of Water Discharged \$0.629
Publicly-Owned Drinking Fountain Volume Rate	\$2.920
<b>INDUSTRIAL EXTRA-STRENGTH RATES</b>	
Biochemical Oxygen Demand	Rate Per Pound \$0.498
Suspended Solids	\$0.602
Allowable Concentrations	Milligrams per Liter
Biochemical Oxygen Demand	300
Suspended Solids	350
Extra Strength Resample Rate	Rate per Composite Sample \$214
<b>DRAINAGE SERVICE CHARGE</b>	
Drainage Service	Rate Per 1000 Square Feet Per Month \$7.91
<b>WILLAMETTE RIVER/PORLAND HARBOR SUPERFUND CHARGE</b>	
Sanitary Volume	Rate Per 100 Cubic Feet of Water Consumption \$0.11
Impervious Area	Rate Per 1000 Square Feet Per Month \$0.42



**APPENDIX C**

# **Capital Cost Estimate Details**

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**Cost Estimate for public storm sewer to serve site NW05**

It is estimated that the peak flow from the site will be approximately 8.1 CFS. A 1140 foot storm sewer is required to connect site to a public storm sewer with adequate capacity for the additional estimated flow. The depth of the pipe ranges from 3 feet at the site to approximately 10 feet at the connection to the existing public storm sewer. This estimate assumes an average 6 foot depth.

The pipe diameter is calculated using Manning's Equation and the estimated flow and pipe slope. The pipe slope is calculated from the the difference between the assumed IE's. The upstream IE is assumed to be 3 feet or minimum cover below the ground elevation. The downstream IE is the IE of the existing puble storm sewer.

The cost estimate is based on the Beech Essex Unit Cost for PVC pipe at 6 foot average depth. Those unit costs were calculated in January of 2003. This cost estimate is adjusted up to current dollars using the September 2007 ENR CCI. Two manholes are assumed. One at 500 feet and one at the alignment change.

January 2003 ENR CCI	<b>6580</b>
September 2007 ENR CCI	<b>8050</b>

Upstream Ground Elevation from USGS 10 ft. Contours	40	ft
Downstream Ground Elevation from Spot Elevations	30	ft
Estimated Flow, Rational Method	8.1	cfs
Length of New Pipe	1140	ft
Diameter of New Pipe, Manning's Eqn. 8-2 Design Manual	15	in
Beech Essex Unit Cost for 15 inch PVC pipe 6 foot deep	206	\$/ft
Manhole costs <i>may check in Means if time</i> .	3000	\$ each

<b>Construction Costs</b>	<b>\$241,000</b>
Contingency (10)%	24,100
Construction Management, Inspection & Testing (15%)	36,150
Design (20%)	48,200
PI, I & C, Easements and Environmental (3%)	7,230
Startup and Closeout (1%)	2,410
<b>Total Cost</b>	<b>\$360,000</b>

# **Shipyard Pump Station Cost Estimating Assumptions**

## ***Pump Station***

If the peak projected influent rate is 2,750-gpm, the firm pumping capacity of the station should be designed for a higher pumping capacity. A firm pumping capacity of 3,000-gpm would provide about a 9% allowance for pump wear. The current PS Design Manual requirement is to allow 20% for pump wear.

The existing wet well active storage volume is approximately 2,450-gallons, and there is no opportunity to increase that volume because the Duty Pump ON Setpoint is already at a water surface elevation that is the same as the influent pipe I.E. The available active volume is not sufficient to accommodate the suggested pumping rate without excessive pump cycling and motor starts.

The City design standard is to size wet well active volume capacity for a minimum cycle time of 10-minutes, or a maximum of 6 motor starts per hour. As indicated in the attached spreadsheet, to achieve a maximum of 6 motor starts/hr would require an active wet well volume of about 7,000 gallons. Dropping the motor starts/hr criteria to allow 10 starts/hr, which is the limit recommend by BES engineering staff, would require an active volume of more than 4,100 gallons.

The existing electrical distribution system has the capacity to operate the two existing 50-hp submersible pumps, and other ancillary station equipment and lighting. This is inadequate to support the motor horsepower required to achieve a 130% increase in the station firm pumping capacity. A completely new, upsized electrical system would be needed.

To achieve the target pumping capacity at this location would require a completely new pump station facility with an appropriately sized wet well, and supporting electrical, control, and alarm systems.

If the modeling shows a wide range of projected influent flow rates, BES should consider the installation of a triplex pumping system similar to what was done at the Montana PS, Simmons PS, and Columbia Slough PS for the same reasons.

The most similarly sized pump station project recently completed by BES was the Montana PS (Project No. 7017), which incurred at total project life cost of \$1,517,439, of which \$1,114,181 was expended in the construction phase.

## ***Pressure Line***

With regard to the pressure line, it appears from the 1997 drawings that 1,160-lf of 12-inch HDPE pipe was installed and tied into the existing 14-inch pipe. The alignment also includes a cased crossing under two parallel railroad tracks that appears to be about 75-ft long, which would also need to be replaced.

### ***Rough/Preliminary Project Cost Estimate***

Planning, Design, of a new 2,750 - 3,000-gpm PS (assume triplex submersible PS configuration)	\$ 450,000
Construction of the PS	\$ 1,200,000
Design of the pressure main modifications	\$ 40,000
Construction of the pressure main modifications (assumes \$240/lf for 14-inch pipe, and a \$ 50,000 allowance for the railroad crossing)	\$ 328,000
Demolition and decommissioning of the "old" PS	\$ 60,000
Sub-total	\$ 2,078,000
30% Contingency	\$ 623,000
Rough/Preliminary Total Project Cost Estimate	\$ 2,701,000

**SHIPYARD PS**

**ROUGH PRELIMINARY EVALUATION OF THE IMPACT OF INCREASING FIRM PUMPING CAPACITY FROM 1,200-gpm to 2,750-gpm**

Maximum Active Wetwell Volume  
Proposed Firm Pumping Capacity

327 ft<sup>3</sup>  
2,750 gpm

2,450 gal

Check Pump Cycle Times:

Influent Flow (gpm)f	Fill Time (min)	Pump Run Time (min)	Cycle Time (min)
0	0.00	0.00	
100	24.50	0.92	25.42
200	12.25	0.96	13.21
300	8.17	1.00	9.17
400	6.13	1.04	7.17
500	4.90	1.09	5.99
600	4.08	1.14	5.22
700	3.50	1.20	4.70
800	3.06	1.26	4.32
900	2.72	1.32	4.05
1,000	2.45	1.40	3.85
1,100	2.23	1.48	3.71
1,200	2.04	1.58	3.62
1,300	1.88	1.69	3.57
1,400	1.75	1.81	3.56
1,500	1.63	1.96	3.59
1,600	1.53	2.13	3.66
1,700	1.44	2.33	3.77
1,800	1.36	2.58	3.94
1,900	1.29	2.88	4.17
2,000	1.23	3.27	4.49
2,100	1.17	3.77	4.94
2,200	1.11	4.45	5.57
2,300	1.07	5.44	6.51
2,400	1.02	7.00	8.02
2,500	0.98	9.80	10.78
2,600	0.94	16.33	17.28
2,700	0.91	49.00	49.91
2,800	0.88	Exceeds Firm Capacity	

Q <sub>RATED CAPACITY</sub> (gpm)	6 motor starts/hr Min. W W Active Volume Required (T <sub>CYCLE</sub> = 10 min.)		10 motor starts/hr Min. W W Active Volume Required (T <sub>CYCLE</sub> = 6 min.)		12 motor starts/hr Min. W W Active Volume Required (T <sub>CYCLE</sub> = 5 min.)		15 motor starts/hr Min. W W Active Volume Required (T <sub>CYCLE</sub> = 4 min.)	
	(gallons)	(cf)	(gallons)	(cf)	(gallons)	(cf)	(gallons)	(cf)
1,200	3,000	401	1,800	241	1,500	201	1,200	160
1,300	3,250	434	1,950	261	1,625	217	1,300	174
1,400	3,500	468	2,100	281	1,750	234	1,400	187
1,500	3,750	501	2,250	301	1,875	251	1,500	201
1,600	4,000	535	2,400	321	2,000	267	1,600	214
1,700	4,250	568	2,550	341	2,125	284	1,700	227
1,800	4,500	602	2,700	361	2,250	301	1,800	241
1,900	4,750	635	2,850	381	2,375	318	1,900	254
2,000	5,000	668	3,000	401	2,500	334	2,000	267
2,100	5,250	702	3,150	421	2,625	351	2,100	281
2,200	5,500	735	3,300	441	2,750	368	2,200	294
2,300	5,750	769	3,450	461	2,875	384	2,300	307
2,400	6,000	802	3,600	481	3,000	401	2,400	321
2,500	6,250	836	3,750	501	3,125	418	2,500	334
2,600	6,500	869	3,900	521	3,250	434	2,600	348
2,700	6,750	902	4,050	541	3,375	451	2,700	361
<b>2,750</b>	<b>6,875</b>	<b>919</b>	<b>4,125</b>	<b>551</b>	<b>3,438</b>	<b>460</b>	<b>2,750</b>	<b>368</b>
2,800	7,000	936	4,200	561	3,500	468	2,800	374
2,900	7,250	969	4,350	582	3,625	485	2,900	388
3,000	7,500	1,003	4,500	602	3,750	501	3,000	401

Key Data on the Existing Wetwell Configuration at Shipyard PS	
Wetwell Type	Round concrete caisson, I.D. 9-ft
Pumps	two 50-hp Flygt CP-3201 submersible pumps
High Water Alarm	Water Surface Elevation 13.3-ft
18-inch Influent	Invert Elevation 11.8-ft
Duty Pump ON	Water Surface Elevation 11.8-ft
Duty Pump OFF	Water Surface Elevation 6.6-ft
Bottom Elevation	3.5-ft +/-





