III. PHASE 2 SITE ANALYSIS

A. PURPOSE OF PHASE 2

Phase 1 of the Regional Industrial Site Readiness Project identified an inventory of 56 sites that offer potential locations for new traded sector investment. The sites were categorized into tiers based on their market readiness, taking into consideration infrastructure, natural resources, brownfield issues, and market availability. Each of the sites in the inventory received a similar level of analysis that allowed for comparison and ranking. The goal of Phase 2 was to conduct a more thorough investigation and analysis of a selected number of sites to better understand the issues confronting sites that are not market ready and what it would take to bring these particular, or more generally all of the non Tier 1 sites, to market readiness.

The Project Management Team that was established in Phase 1 continued to serve their same leadership role during Phase 2 of the Project. Funding for Phase 2 expanded from the original Phase 1 group[11] to include jurisdictions from around the region as well as other private sector organizations[12].

Phase 2 sites were chosen from the Tier 2 and Tier 3 inventory to represent the wide variety of development barriers found in these categories. The PMT chose the Phase 2 sites in order to illustrate the challenges of bringing Tier 2 and Tier 3 sites to Tier 1 development-ready status. The Phase 2 analysis focused on both the costs and time required to make the sites development ready. Additionally, the analysis identified the potential economic benefits that could be generated through investment and development of the individual sites.

B. PHASE 2 METHODOLOGY

1. Selection and Concept Planning of the Phase 2 Sites

The PMT identified 11[13] Phase 2 sites from the total list of 47 non-Tier 1 sites for more detailed analysis. This subset of sites represent the challenges and opportunities found in the full inventory of Tier 2 and Tier 3 sites as well as a diversity of site size and tiers. Specific criteria for Phase 2 sites included:

- Representative of the development constraints
- Distribution around the region
- Diversity of potential traded sector users

Table 13: Tier 2 and 3 Potential Development Constraints

CONSTRAINT *	SITES WITH CONSTRAINT
Brownfield/Cleanup	8
Natural Resources	13
Infrastructure	19
Transportation	18
Land Assembly	14
State/Local Action[1]	20
Not Willing to Transact	18

**Sites may have multiple constraints*

Source: Group Mackenzie

[11] Project Management Team included: Business Oregon, Metro, NAIOP Oregon Chapter, Port of Portland, and Portland Business Alliance

[12] Phase 2 project funders included: Commercial Real Estate Economic Coalition (CREEC), Clackamas County, City of Gresham, City of Hillsboro, City of Portland, City of Sherwood, City of Wilsonville, Howard S. Wright, National Electrical Contractors Association, Oregon-Columbia Chapter, Oregon State Building & Construction Trades Council, Portland General Electric, Plumbing & Mechanical Contractors Association, Sheet Metal & Air Conditioning Contractors National Association , Three Oaks Development Company, and Westside Economic Alliance.

[13] One of those 11 sites was split into two separate sites, therefore for the remaining portion of this report there will be 12 Phase 2 sites.

Representative of Development Constraints

Phase 1 of the project identified a list of issues constraining the development readiness of Tier 2 and 3 sites in the region, which can be seen in Table 13.

These development issues fell into three broad categories: environmental and natural resource; infrastructure; and land use issues. The chosen Phase 2 sites covered all of these constraints, with all of the sites having more than one constraint. Table 14 displays the development issues by both major category and then by specific constraint that was used in the analysis of each of the Phase 2 sites.

Table 14: Development Issues for Phase 2; Tier 2 and Tier 3 Sites

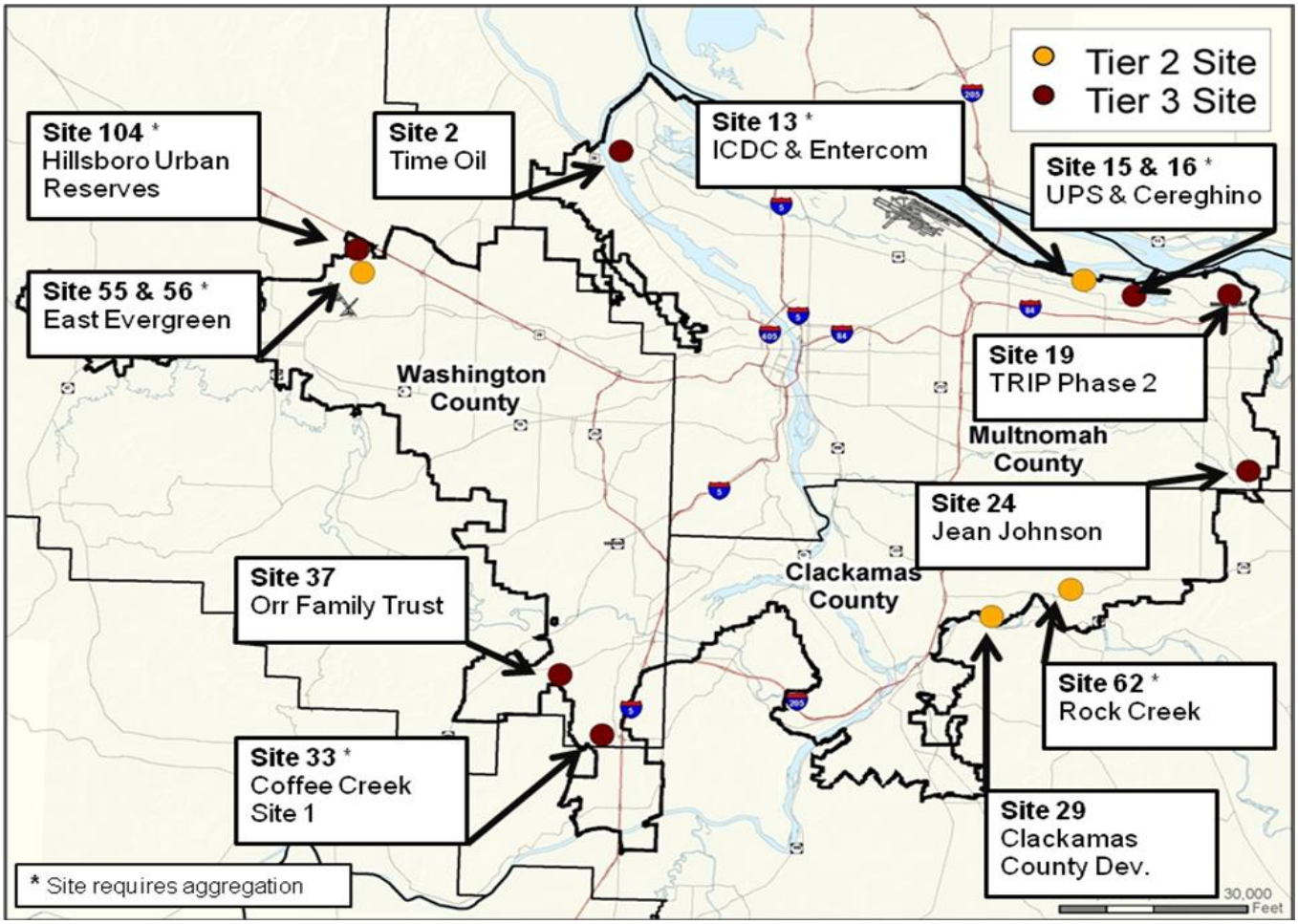
Environmental and Natural Resource Issues	Infrastructure Issues	Land Use Issues
Brownfield Cleanup	Water	Aggregation
Wetland Fill	Sewer	Annexation
Floodplain Fill	Storm	Outside UGB
Slope Mitigation	Transportation	

Source: Group Mackenzie

Distribution around the Region

The Portland metropolitan area has different development submarkets that reflect cluster industry development, market demand, pricing, development issues, and jurisdictional governance. Phase 2 sites reflect this diversity of geography and are distributed around the metropolitan area (Figure 6).

Figure 6: Phase 2 Site Map



Source: Group Mackenzie

Diversity of Potential Traded Sector User

Phase 1 of the study identified potential targeted industries for each of the Phase 1 inventory of sites based on those included in state and regional economic development strategies. Business Oregon profiles of these traded sector industries are included in Volume 3, Appendix E. Each of those targeted industries has at least one Phase 2 site that has the potential to meet their requirements. The traded sector industry profile for each site was chosen based on several factors including location, size, transportation, infrastructure, and surrounding industry type. Each site was individually reviewed by the PMT and several local real estate professions. The final designated use for each site was approved by the local jurisdiction.

Taking into consideration these three decision criteria, the list of Phase 2 sites is shown in Table 15.

Table 15: Phase 2 Sites

Site	Location	Ownership	Tier	Potential Development Constraint	Traded Sector Industry
13. ICDC LLC and Entercom (46 net acres)	Portland Multnomah County	Private	Tier 2	Potential wetlands	Warehouse distribution
29. Clackamas County Development (40 net acres)	Clackamas Clackamas County	Public	Tier 2	Brownfield cleanup; wetland mitigation	General manufacturing
55. Spokane Humane Society **56. East Evergreen** (116 net acres)	Hillsboro Washington County	Private	Tier 2	Aggregation; wetland mitigation	Clean Technology Campus
62. Rock Creek (36 net acres)	Happy Valley Clackamas County	Private	Tier 2	Aggregation; slope mitigation	High Technology Campus
2. Time Oil Company (39 net acres)	Portland Multnomah County	Private	Tier 3	Brownfield Cleanup; Floodplain fill	Heavy industrial manufacturing and marine
15. BT Property (UPS) **16. Michael Cereghino** (65 net acres)	Gresham Multnomah County	Private	Tier 3	Aggregation; Owner not willing to transact; Potential wetlands	General Manufacturing
19. TRIP (Phase 2) (54 net acres)	Troutdale Multnomah County	Public	Tier 3	Brownfield cleanup; Wetland mitigation	Warehouse Distribution
24. Jean Johnson (33 net acres)	Gresham Multnomah County	Private	Tier 3	Annexation	High Technology Campus
33. Coffee Creek Site 1 (67 net acres)	Wilsonville Washington County	Private	Tier 3	Aggregation	General Manufacturing
37. Orr Family Farm[14] (77 net acres)	Sherwood Washington County	Private	Tier 3	Annexation; Slope mitigation; Owner not willing to transact	General Manufacturing
104. Hillsboro Urban Reserves (309 net acres)	Hillsboro Washington County	Private	Tier 3	Aggregation; Annexation; Infrastructure	Clean Technology Campus
TOTAL	5 Mult. Co. 4 Wash. Co. 2 Clack. Co.	2 Public 9 Private	4 Tier 2 7 Tier 3		

Source: Group Mackenzie

[14] Later on in the Phase 2 analysis, this site was split into two separate sites, with two separate uses, at the request of the City of Sherwood.

2. *Site Concept Plans*

The industry profiles were used to prepare a conceptual site master plan and identify the off-site infrastructure demand as well as the economic benefits for each of the 12 sites. The individual site concept plans are based on industry and development knowledge of the consultant team. The concept development plan was created for a full build-out scenario to show the maximum/best use of the site. Brownfield remediation costs were estimated as well as wetland mitigation costs. Permitting and development timelines for the necessary improvements were also estimated. Development cost analyses were completed for each of the concept plans to show the financial gap that would need to be overcome in order for the site to meet market pricing requirements. Economic benefits were determined by preparing key economic performance measures for each of the site development scenarios based on the types of industry sectors assumed for each of the sites.

The following sections provide a more detailed description of the Phase 2 methodology.

3. *Off-site Infrastructure Analysis*

The Phase 2 infrastructure analysis included evaluating the existing public utility systems for their capacity to serve the selected industrial use identified for each site. Group Mackenzie developed a utility demand model for the proposed industrial uses and then identified improvements to the utility system that would be needed in order to extend or upgrade service to accommodate development at the Phase 2 sites. Finally, cost estimates were developed for the utility improvements.

Utility Demand Model

The utility demand for each of the Phase 2 study sites was determined for the public water and sewer systems using a model based on the Business Oregon's industrial use profiles, which presents minimum utility capacities and pipe sizes for various industrial use types.

Group Mackenzie converted the State's utility demand models to a per-acre basis by dividing each utility demand by the profile site acreage. As described above, the PMT assigned an industrial use type to each of the Phase 2 sites. Table 16 below summarizes the utility demand model for each of the industrial uses represented in the Phase 2 sites.

Table 16: Utility Demand Model for Types of Uses

Site Profile	Clean Technology Campus	Heavy Industrial	General Manufacturing	High-Tech Manufacturing	Warehouse and Distribution
Site Acreage (ac)	100	25	10	25	80
Water Demand (gpd)	1,000,000 10,000 gpd/ac	36,100 1,444 gpd/ac	17,000 1,700 gpd/ac	65,300 2,612 gpd/ac	12,000 150 gpd/ac
Sewer Demand (gpd)	1,000,000 10,000 gpd/ac	32,500 1,300 gpd/ac	15,300 1,530 gpd/ac	58,800 2,352 gpd/ac	11,700 146 gpd/ac

Source: State of Oregon – Oregon Business Development Department

The estimated utility demand for each Phase 2 site was calculated by multiplying the model per-acre demand by the net developable acres for each site. Table 17 summarizes the estimated utility demands for the Phase 2 sites.

Existing Utility System Evaluation

Group Mackenzie evaluated the current public utility systems at each Phase 2 site to determine the capacity of the existing infrastructure to accommodate the proposed industrial development. The Phase 2 utility review followed much of the same methodology as the Phase 2 research described previously in this report. However, the Phase 2 analysis focused more on identifying specific capacity issues that could hinder the ability to serve the industrial uses on the Phase 2 sites.

Group Mackenzie reviewed publicly available utility information for the Phase 2 sites, including GIS mapping, previously prepared master plans, and information provided by public staff. Table 18 summarizes the information sources reviewed for the Phase 2 sites.

Table 17: Estimated Utility Demands for Phase 2 Sites

Site	Industrial Use Type	Net Developable Acreage	Estimated Water Demand (gpd)	Estimated Sewer Demand (gpd)
1. ICDC LLC and Entercom	Warehouse distribution	48.5	23,000	23,000
29. Clackamas County Development	General manufacturing	40	68,000	61,200
55. Spokane Humane Society **56. East Evergreen**	Clean Technology Campus	116	1,160,000	1,160,000
62. Rock Creek	High Technology Campus	34	88,800	80,000
2. Time Oil Company	Heavy industrial manufacturing and marine	25	36,100	32,500
24. Jean Johnson	High Technology Campus	33.8	88,300	79,500
15. BT Property (UPS) **16. Michael Cereghino**	General Manufacturing	74.45	126,500	113,900
19. TRIP (Phase 2)	Warehouse Distribution	80	12,000	11,700
33. Coffee Creek site 1	General Manufacturing	80.34	136,600	122,900
37. Orr Family Farm[15]	General Manufacturing	42.8	72,800	65,500
104. Hillsboro Urban Reserves	Clean Technology Campus	309.20	3,092,000	3,092,000

Source: Group Mackenzie

[15] The southern portion of the site was designated as a business park.

Table 18: Existing Utility System Evaluation Sources

Phase 2 Site	Utility Information Reviewed
13. ICDC LLC and Entercom	▪ City of Portland GIS mapping and as-built plans
29. Clackamas County Development	▪ Clackamas County Capps Road Site Preliminary Concept Planning (Group Mackenzie, 2010) ▪ FEMA Flood Insurance Rate Map 41005C0045D
55. Spokane Humane Society **56. East Evergreen**	▪ City of Hillsboro Water Department staff information ▪ North Hillsboro Industrial Strategy (Group Mackenzie, 2011) ▪ Clean Water Services staff information ▪ Clean Water Services GIS Mapping
62. Rock Creek	▪ Sunrise Water Authority GIS mapping ▪ Clackamas County Sewer District No. 1 Sanitary Sewer Master Plan (June 2009)
2. Time Oil Co.	▪ City of Portland GIS mapping and as-built plans ▪ FEMA Flood Insurance Rate Map 4101830060F ▪ Port of Portland staff information
15. BT Property (UPS) **16. Michael Cereghino**	▪ City of Gresham GIS Mapping ▪ City of Gresham staff information
19. TRIP (Phase 2)	▪ City of Troutdale GIS Mapping ▪ Port of Portland staff information
24. Jean Johnson	▪ Springwater Community Plan Report Public Facilities Plans (November 2005) ▪ City of Gresham GIS Mapping ▪ City of Gresham staff information
33. Coffee Creek site 1	▪ City of Wilsonville GIS Mapping ▪ Coffee Creek Planning Area Preliminary Engineering Summary (March 2011) ▪ City of Wilsonville staff information
37. Orr Family Farm	▪ City of Sherwood staff information ▪ City of Sherwood Sewer Master Plan (2007) ▪ City of Sherwood Water Master Plan (2005) ▪ City of Sherwood Stormwater Master Plan (2007) ▪ Clean Water Services GIS Mapping ▪ Clean Water Services Sanitary Master Plan Update (2009)
104. Hillsboro Urban Reserves	▪ City of Hillsboro staff information ▪ City of Hillsboro GIS Mapping ▪ Clean Water Services staff information ▪ Clean Water Services GIS Mapping

Source: Group Mackenzie

Public Utility Improvement Cost Estimates

Group Mackenzie developed cost estimates for public utility improvements that would be necessary at the Phase 2 sites to extend service or expand capacity in order to accommodate the proposed industrial developments. The utility improvements identified in this study represent the expected minimum construction required to serve the site based on the reviewed utility information listed above. This includes utility extensions at the edge of the existing service boundary, where jurisdictions generally require that developers extend utilities from the current boundary to the far edge of the site, even if the site does not require the public main beyond a proposed connection point.

The utility cost estimates were developed based on minimum pipe footage for the public utility systems. The unit costs used in the study are intended to represent a per-foot cost for the entire utility system including associated accessories. For example, the unit cost for storm piping incorporates a contingency cost for catch basin inlets, manholes, and water quality treatment facilities. The sewer and water pipe unit costs incorporate similar manholes, hydrants, valves, etc.

This study incorporates utility improvements to the public system only and does not include on-site utilities that would be needed to serve the proposed developments. For example the storm system improvements identified for a site does not include on-site piping, manholes, water quality treatment facilities, detention ponds, or other stormwater related systems that handle runoff from the private development. Where appropriate, Group Mackenzie has tried to incorporate regional detention facilities at the Phase 2 sites, which could eliminate the need for separate private detention ponds to be constructed on site. Such regional detention facilities are expected to be sized to handle stormwater runoff from both on-site surfaces and the public right-of-way.

The public utility analysis summary for each site is provided in the Phase 2 Utility Valuation, presented in Volume 3, Appendix G.

4. Off-site Transportation Analysis

Transportation infrastructure was evaluated for Phase 2 sites in the following manner:

- Planning documents were reviewed. This includes transportation system plans (TSPs), specific area plans, capital improvement plans, specific infrastructure plans, etc. It should be noted not all planning documents reviewed were adopted, nor were all relevant projects funded. In cases where future transportation infrastructure was identified in planning documents that were not adopted or the projects were not funded, agency staff were specifically consulted to determine appropriate assumptions to make regarding the provision transportation infrastructure and construction timing.
- The consultant worked with the jurisdictional agency to specifically determine property access locations from the existing/future public roadway road system. This also included working with the Group Mackenzie design team to ensure the public roadway connections function with the conceptual site layouts.
- Planning level infrastructure improvement costs were determined. Based on combined agency infrastructure cost estimates, unit costs were determined. The base unit costs include:
    - $1,400 per linear foot of industrial roadway, and
    - $250,000-$500,000 per intersection improvement, additional travel lanes or signalization.
- Infrastructure improvement needs were determined. This included identifying improvements to existing roadways, new roadways and alignments, and intersection improvements. Infrastructure assumptions were also confirmed with the jurisdictional agency to ensure all necessary improvements were identified.
- The above-identified unit costs were then applied to the necessary improvements. The resulting infrastructure costs were then compared to agency-assumed costs if available. If differences existed, agency staffs were consulted and estimates were modified as necessary.

- Time to construct transportation infrastructure was determined. In most cases, it was assumed the necessary transportation infrastructure improvements can be designed and constructed in one construction season which is typically less time than for site building improvements. Therefore, infrastructure construction is generally not considered on the critical path.

Overall, the intent was to identify accurate transportation infrastructure costs and recognizing specific agency needs while maintaining a consistent assumption set. The transportation analysis summary for each site is provided in Volume 3, Appendix H.

5. On-Site Wetlands

For the Phase 2 sites, Oregon Department of State Lands' (DSL) staff first consulted the agency's Land Administration System database to determine if there were any wetland determinations or delineations on file with the agency for each site. Where such information did exist, it was used as the foundation for identifying the area of wetland constraint.

For sites with no previous wetland delineation history, the following data layers were used to identify area of potential wetland constraints:

- National Wetlands Inventory, US Department of the Interior, 1988
- Local Wetlands Inventory (for those communities with adopted inventories)
- Metro Regional Land Information System, wetlands data layer, (February 2011)
- Salmon Resource and Sensitive Area Mapping program, Oregon Dept. of Transportation, 2004
- Soil Survey Geographic Database (US National Resources Conservation Service, 2009) to identify of potential hydric (wetland) soil areas
- National Hydrography Dataset, US Geological Survey
- 2011 Oregon Explorer Imagery (aerial photography 1m resolution) to identify photo-signatures that may indicate areas of prolonged soil saturation or inundation.

The wetland mitigation cost estimates for each Phase 2 site[16] are presented in Volume 3, Appendix I. It is important to note that the methodology for this study assumes a user for each site so that all costs and timelines can be estimated. However DSL does not allow wetland permitting and mitigation to occur without a user in place, so the wetland mitigation estimates provided are not conclusive[17]. Furthermore, this study does not utilize the costs provided by DSL for two of the Phase 2 sites, 55/56 East Evergreen and 104 Hillsboro Urban Reserves due to local knowledge specific to these sites[18].

6. On-site Brownfields Remediation Analysis

Ash Creek Associates, Inc. (Ash Creek) prepared an assessment of environmental conditions on the Phase 2 industrial development sites. Ash Creek's report[19] evaluated whether potential hazardous substances (including petroleum hydrocarbons) may be present at the 12 sites. Where potential impacts by hazardous substances were identified, Ash Creek developed conceptual cost estimates for assessment and remediation. The cost estimates and schedules are conceptual in nature because:

1. They are based on a limited review of publicly-available files;
2. Ash Creek staff did not enter the subject properties or interview property owners; and

[16] The wetland analysis for the Orr Family site was analyzed separately, as the north and south portion of the site have different wetland issues.

[17] This issue is identified in the Recommendations section of the report as one to potentially address to improve site readiness.

[18] These two sites are located directly adjacent to each other. Costs identified from the previously completed North Hillsboro Industrial Development Strategy (March 2011) were used for the East Evergreen site; no wetland costs were identified for the Hillsboro Urban Reserves site 104 based on a lack of both informed DSL information and on the ground analysis, but local knowledge from the previously completed work.

[19] Ask Creek Associates, Inc. prepared a more detailed methodology and results report in Volume 3, Appendix L.

3. Collection and analysis of environmental media (soil, sediment, groundwater, air) was not performed. The information presented herein, along with a number of factors, will be considered by Group Mackenzie to assess overall development costs for the prospective development sites.

Ash Creek was provided with the list of Phase 2 development sites[20]. Ash Creek completed the following scope of services for each candidate site:

1. Obtained and reviewed historical aerial photographs.
2. Reviewed the Oregon Department of Environmental Quality (DEQ) Facility Profiler and the Environmental Cleanup and Site Information (ECSI) online databases of sites with known or suspected use or releases of hazardous substances.
3. Performed a site reconnaissance to observe current conditions and obtain photographs of the subject properties and surrounding facilities of interest.
4. For properties that are listed in the DEQ Facility Profiler or ECSI databases due to releases of hazardous substances (confirmed or suspected), Ash Creek obtained and reviewed readily available relevant files.
5. In cases where hazardous substances are suspected or confirmed, Ash Creek developed a cost estimate and schedule for anticipated environmental assessment and remediation activities.
6. Developed an assessment and remediation cost estimates for each property where hazardous substance contamination is suspected or confirmed.

The brownfield remediation cost estimates and detailed analysis for each Phase 2 site are presented in Appendix L of this report.

7. Other On-site Issues

Floodplain Fill Mitigation

According to Title 3 (Water Quality and Flood Management) of the Metro Urban Growth Management Functional Plan, construction and development within the base flood floodplain cannot result in an increase of the flood elevation. Additionally, any earthwork fill that is placed within the floodplain must be balanced by an equal volume of cut in order to maintain the flood storage volume within the floodplain.

At a minimum, the floodplain balance requirement applies to the 100-year-flood as documented on a Flood Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). Metro has also identified certain areas which must meet more stringent flood requirements and need to balance all fill placed within the February 1996 Flood Inundation zone.

In addition to balancing all fill placed within the floodplain, development within the 100-year-floodplain (or 1996 Inundation zone if required) must also provide minimum clearance above the documented base flood elevation to the first floor of structures within the floodplain.

Since industrial buildings are generally considered non-habitable structures, they may be legally exempt from the freeboard requirement; however, it is generally accepted practice that buildings should be located at least one foot above the base flood elevation for insurance requirements. Storage yards or truck maneuvering areas should be no lower than about 18 to 24 inches below the base flood elevation, and automobile parking areas should be no lower than about six inches below the base flood. Only one Phase 2 site, Time Oil, has floodplain issues present.

[20] Ash Creek did not analyze the two sites on the Orr Family property separately, as they are on one parcel.

Building Pad Surcharging

Several of the sites in the Phase 2 inventory require the building pad area to be surcharged to reduce the potential for total and differential site settlement. Settlement occurs when the load from a building consolidates the subsurface soil and effectively squeezes out water from the soil profile. This results in the building floor dropping and can cause slab cracking, uneven floors, and in extreme cases structural instability.

Consolidation settlement is most likely on sites with soft or loose underlying soils, which are common in many areas across the Portland region. Settlement is often mitigated by constructing a soil berm across the proposed building footprint, which surcharges the subsurface soils and initiates the consolidation settlement under the soil load. Once the settlement is complete from the soil loading, the soil berm is removed and the site is prepared for the building construction. This way, the surcharged soil will not experience further settlement under the building load.

The cost and timeframe for the surcharging process can vary widely depending on the amount of soil used to pre-load the site. A shallower depth of soil imparts a lighter load to the soil than a tall soil berm, and will take substantially longer to achieve full consolidation of the underlying soil. For the Phase 2 site analysis, Group Mackenzie has assumed that the sites would be surcharged with an approximate 8-foot-tall soil berm.

Additionally, Group Mackenzie has assumed that the building pad areas would be surcharged with a series of soil berms that are rolled in stages across the site. In this process, a portion of the site is surcharged fully until the soil berm is moved to the next section of the building. Group Mackenzie has assumed that each surcharge stage would take approximately six months to reach full consolidation before getting moved to the next stage of the building pad.

The surcharge process can be expedited by adding more soil to the berm. If the berm is expanded to cover the entire building area at once, then the berm does not need to be staged across the building footprint. Alternatively, if the soil berm is thickened, then the time to reach full consolidation is reduced. In general, Group Mackenzie estimates that doubling the volume of soil (thereby doubling the cost) would cut the entire surcharge process time approximately in half.

The site surcharge cost estimates are presented in the Phase 2 Utility Valuation in Volume 3, Appendix G.

Slope Mitigation

In general, industrial development sites have relatively strict limitations on the slope that can be reasonably accommodated across a site. Industrial buildings generally have large footprints with a level floor slab, so minimal grade difference can be accommodated across the buildings. Similarly, truck maneuvering areas should be limited to about five percent slope to facilitate safe and efficient truck movements on site. In general, the average slope across an industrial site should be limited to about five to seven percent.

Several of the Phase 2 sites contain sloped areas that exceed the average slope maximum and would require significant levels of site grading to accommodate industrial development. Group Mackenzie estimated the amount of site grading earthwork and retaining structure construction that would be required to mitigate steeply sloped areas on the Phase 2 sites. The slope grading earthwork estimate represents only the construction required to flatten steep slopes, and does not include mass grading associated with leveling and preparing the site for building pads, vehicular areas, or other site facilities. Such on-site grading is assumed to be included in the on-site construction costs associated with a specific site development plan.

The slope mitigation cost estimates are presented in the Phase 2 Utility Valuation in Volume 3, Appendix G.

8. *Land Use Planning Issues*

Annexation

The annexation process and timeframe differs in each jurisdiction. For example, in the City of Gresham, the property must be adjacent to the current city limits boundary in order to annex. If the property is not, the owner must wait until adjacent properties that are adjacent to the city limits boundary annex. In the City of Sherwood, the annexation is owner initiated and annexation requires voter approval on the May or November ballot. The annexation process for each of the Phase 2 sites that require annexation was identified by the local jurisdiction and reflected in the timelines for each site.

Aggregation

The need to aggregate individual parcels into a development site is a significant constraint for potential sites that have multiple owners. The aggregation process can take significant time, thus adding to the overall timeline and complexity of bringing sites to Tier 1 readiness. It is impossible to determine this aggregation time and therefore this is a variable that this study was unable to estimate. The study made the very conservative assumption that an agreement to aggregate was in place prior to initiating the permit timelines.

This study estimates, a "short", "medium", and "long" aggregation period, depending on the number of property owners in question in order to show the potential complexity of this issue. Similar to the tiering timelines, it was assumed that "short" aggregation period is 6 months or less; "medium" is between 6 months and 2.5 years; and "long" is over 2.5 years. Table 19 describes the assumptions used to determine the aggregation time.

Table 19: Aggregation Timeline Determination

MARKET AVAILABILITY	AGGREGATION TIMELINE DETERMINATION
If **all** properties are currently on the market	1.5 months per property owner
If owner(s) is/are on the market **and** other(s) is/are willing to transact	1.5 months per on the market property plus 3 months for willing to transact property
If owner(s) is/are not on the market **but** willing to transact	6 months per property owner
If property(ies) is/are not on the market **and** not willing to transact	Not able to estimate

Source: Group Mackenzie

9. *Electrical Power Supply*

Group Mackenzie coordinated with Portland General Electric (PGE) to review the existing electrical power system's capacity to provide service to the proposed industrial developments at the Phase 2 sites. The electrical demand for an industrial user can be very specific to the industrial processes and uses occurring on site, even within similar industrial types. Therefore, PGE's review of the Phase 2 site power infrastructure included developing a broad estimate for power demand and general improvements that would be necessary to supply power to the proposed industrial developments. PGE reported the power improvements for each site based on a scale of 1 (easy) to 3 (hard) to demonstrate the relative cost and complexity of extending or upgrading the existing power infrastructure to serve the proposed new developments. PGE's detailed report is provided in Volume 3, Appendix J.

10. Economic Costs and Benefits

The development costs and fiscal impact analysis prepared for this study by Johnson Reid focused on determining the cost "gap" to bring each of the 12 Phase 2 sites from their current status to development readiness. The analysis also determined the potential jobs and tax revenues that could be created by a conceptual development plan prepared for each of the sites.

For the "gap" analysis, the work evaluated Phase 2 sites from the perspective of market participants that are responsible for development activity. Market participants can include land owners, end-users, land developers, and public agencies. The decision making is fundamentally dictated by economic and fiscal constraints. This analysis evaluates the development costs associated with the identified constraints (e.g., lack of utilities and transportation infrastructure, wetland and floodplain mitigation, brownfield cleanup) and the time required to address these constraints *in relation to* the future value of the site. This "cost-value" approach translates the sum of development costs into an assessment of the market's ability or inability to bring sites to a development or recruitment ready status.

Market Viability Analysis Methodology

While making investment decisions, market participants will evaluate the balance of dollar costs[21], time, and risk against the future value of the investment. Presented numerically:

Equation 1

$$Future\ Value \geq \sum (Dollar\ Cost, Time, Risk)$$

When this equation holds true, and the future value of a site outweighs or is at least equal to the sum of costs associated with site development, the market will tend to produce development activity in the long-run, all else equal. However, this balance does not always hold true. Particularly for sites with considerable constraints, the equation is reversed:

Equation 2

$$Future\ Value < \sum (Dollar\ Cost, Time, Risk)$$

In this condition, a number of outcomes could occur. When the differential between cost and value is narrow, enough time may pass for future land values to appreciate to a level which may persuade market activity[22]. Alternatively, a market participant with a lower risk and time threshold may emerge. However, when the differential is large relative to future value, the potential reward is not sufficient to encourage private investment. In this instance, the more likely scenario is for the site to remain in an unusable condition, or eventually transition to a higher value use to justify higher future land value[23].

With this basic foundation in mind, Johnson Reid evaluated each half of this balance individually. The value/cost balance was then reconciled to determine the aforementioned differential, and elaborated on its meaning and implications on site readiness.

The evaluation process began with an assumption that owners are motivated to transact and that the sites are aggregated. This is clearly not always the case, and aggregation is a costly obstacle to site development. However, aggregation costs and timing are difficult to estimate and therefore are not included in the analysis. For this analysis, Johnson Reid erred on the side of a conservative cost estimate.

[21] Including acquisition

[22] Although land appreciation generally requires increasing scarcity relative to demand.

[23] Higher value users most often require a change in zoning, for example, industrial zoning to commercial or residential zoning.

Costs: Dollar Cost, Time, and Risk

Johnson Reid's cost analysis evaluated the development constraints precluding Tier 1 status. Constraints included lack of off-site infrastructure and transportation, and on-site costs for wetland mitigation, floodplain fill, slope mitigation and brownfield cleanup. For one site, Time Oil adjacent to the Willamette River, infrastructure also included the in-water construction of a dock to accommodate a marine-dependent metals manufacturing use of the site.

Group Mackenzie provided dollar costs (Hard Costs) for addressing each site's off-site and on-site constraints[24] and development schedules (time) for each identified constraint. Johnson Reid then considered Soft Costs[25], and utilized the development schedules for each activity to calculate the time cost of money[26]. Development schedules were also used to quantify the cost of risk[27], the premium required to encourage investment. Taken together, these baseline inputs determined the total cost of bringing the site to development readiness. Stated numerically:

Equation 3

$$\textit{Total Site Development Cost} = \sum \textit{(Hard Cost, Soft Cost, Time Cost, Risk Premium)}$$

In addition to site development, an acquisition price an entity would pay a current land owner for sites "as-is" must also be considered. This is a difficult assumption to make, as it does not indicate the residual "value" of the land from a purely market perspective. Rather, it represents the price a land owner would reasonably transact today; this is referred to as the "strike price". In reality, the real strike price will vary widely by site. Absent each aggregated site being listed on the open market, there is no true way of knowing what this will be. As a necessary supplement, Johnson Reid assumed that an across the board strike price of $4.50 per-square-foot would reasonably encourage land owners to enter contract negotiations. Therefore, the entire right side of Equations 1 and Equation 2 is represented by the following:

Equation 4

$$\sum \textit{(Dollar Cost, Time, Risk)} = \textit{(Strike Price + Total Site Development Cost)}$$

Future Value

On the left side of equations 1 and 2, the future market value of each site as a development ready site was calculated; in other words, after site development activities have occurred. The future value of a site is simply a function of its current value as-if a Tier 1 site, plus time, plus an assumed land appreciation (or depreciation) rate. Again, numerically:

Equation 5

$$\textit{Future Value} = \textit{Current Tier 1 Price } (1+\textit{Appreciation Rate})^{t}$$

$$\textit{Where } t = \textit{Site Development Period}$$

Time in this case is the actual site development period provided by Group Mackenzie, and the land appreciation rate is consistent with 30-year growth in inflation[28]. However, the assumption of current Tier 1 value for each site required more diligence. This assumption was derived out of both quantitative and qualitative elements. Where available, Johnson Reid began with comparable sale and listing prices by submarket. This information provided a sound basis, but data points were limited and land deals are often highly unique. Therefore, two alternative sources

[24] Building construction costs and project specific site costs are not included. On-site costs were taken through what is referred to as "mass grading".

[25] Calculated at 20% of Hard Costs. Represent architectural, engineering, legal, fees, SDC's etc.

[26] Calculated at a 7% annualized rate from the period dollars are spent in the development schedule to site development readiness.

[27] Risk thresholds were estimated linearly as 2.5% for every 6 months of development time, from a 24 month basis of 15%. For example, a site with a site development period of 24 months would be associated with a 15% return on costs, while a site with a 30 month development timeline would require a 1.75% return. Risk premiums were grossed up by 1/6th for site with moderate brownfield remediation and by 1/3rd for sites requiring significant brownfield remediation.

[28] As measured by the Consumer Price Index.

of information were consulted; the industrial real estate brokerage team at CB Richard Ellis (CBRE) and member brokers of the local chapter of Society of Industrial and Office Realtors (SIOR). Each of the Phase 2 sites where discussed with these experts and a price was identified for market ready, similar sized sites in each of the submarkets where the sites where located. Responses were combined with the physical data to determine a market ready price[29].

Reconciliation of Value and Costs

Finally, Johnson Reid reconciled Equation 1 to determine the differential between the future value of a site and its associated costs. This differential represents the "Market Viability Gap" or "Surplus" of the site. Numerically:

Equation 6

$$MV = Future\ Value - \sum (Dollar\ Cost, Time, Risk)$$

Where MV is negative, a viability gap exists; the cost to acquire and provide infrastructure exceeds expected market value. Where MV is positive, the site should attract the interest of the market, within the construct of this model.

Where they exist, Johnson Reid looked to identify "market viability gaps" of constrained sites and then quantified these gaps in both dollars and time to understand "how far away" the site is from market viability. Because an assumption of land appreciation was used, this assumption can be quantified both in terms of dollars and the length of time it would take for the site to be priced for a market based transaction. This allowed the consultants and PMT to understand the magnitude of the gaps, and begin thinking about solutions to improve market viability.

Economic and Fiscal Impact Methodology

Once the necessary gap that sites would require for improvement has been quantified, Johnson Reid evaluated the potential benefits those catalytic investments could generate. This process began with the assumption of a Tier 1 site and motivated end user. This analysis is theoretical in nature. Group Mackenzie produced concept plans for each site to represent a conceptual end user. Based on what is known about how these types of industries operate, and the costs of building their facilities[30], Johnson Reid derived economic and fiscal estimates of these activities. This analysis considered the following impacts:

Economic Impacts from site development, facility construction, and on-going operations:

- Business Revenues, *(Direct, Indirect/Induced)*
- Jobs, *(Direct, Indirect/Induced)*
- Payroll Wages, *(Direct, Indirect/Induced)*

Fiscal Impacts from site development, facility construction, and on-going operations:

- Property Tax Revenues from real property, and
- State Payroll Tax from payroll wage impacts.

The fiscal impact of property taxes is underestimated due to the methodology excluding capital equipment from the analysis. This is taxed as personal property as opposed to real property. For large users, the assessment of such property is determined on an individual basis, with complicated measures of depreciation, value, and incentives. The analysis erred on the side of conservative estimates vs. speculating on these broadly varying impacts. It should be noted that these investments can be significant, especially among high-tech and clean-tech users. As such, the economic impact findings are highly conservative. Local fees and taxes were also excluded, again resulting in some under estimating of the positive fiscal impacts on local governments.

[29] This price was then reviewed by the consultant team and Kirk Olsen of Dermody Properties, a member of the PMT, for a final determination.

[30] Per-Square-Foot construction cost by facility type was provided by Group Mackenzie with support from Perlo Construction. The construction costs were calculated at: Spec general manufacturing at $55/SF; general manufacturing at $70/SF; warehouse at $25/SF; clean manufacturing/fab at $75/SF; office at $130/SF; Central Utility Building at $150/SF.

IMPLAN Economic Impact Methodology

To model the economic impacts of various activities, Johnson Reid utilized IMPLAN (IMPact for Planning)[31] input/output multiplier model methodology. This methodology is widely used by public and private entities.

Economic impact analysis generally seeks to assess changes in overall economic activity within a specific geographic area as a result of a change in one or many specific activities. In this case, site development, facility construction, and on-going business activity were modeled. The ripple effect of a gain or loss in economic activity is identified in three stages: *Direct Impacts*, *Indirect Impacts* and *Induced Impacts*.

- *Direct Impacts:* The actual change in activity affecting a local economy. For example, if a new high-tech building is constructed, direct economic impacts comprise the business revenues for that firm/user, as well as the jobs required by that business and the labor income paid.
- *Indirect Impacts:* The response of all other local businesses within the geographic area to the direct impact. Continuing the previous example, indirect impacts of a high-tech user would comprise revenues for related venders, i.e. materials wholesalers, subcontractors, etc., and the jobs and labor income thereby generated.
- *Induced Impacts*: The response of households within the geographic area affected by direct and indirect impacts. In the given example, induced impacts would be the increase in all categories of spending by households in the geography directly or indirectly employed by the businesses' activities.

Because IMPLAN's multiplier approach recognizes the relationship between revenues, jobs, and payroll, only one input is needed to determine the others. Therefore, job estimates could be used to determine business revenues, or vice versa. Johnson Reid's approach to estimating each activity type is outlined below.

Site Development

Economic impacts were calculated based on the dollar cost and site development schedules provided by Group Mackenzie. Hard and soft impacts were considered separately and summed.

Facility Construction

Estimates of facility construction costs for different types of structures (e.g., production, office) provided by Group Mackenzie, with support from Perlo Construction, were the starting point. These dollar costs were inputs in the IMPLAN model to produce jobs and payroll estimates. However, assumptions of the rate to which firms in different industries absorb space were needed. To avoid making hypothetical phasing estimates of conceptual plans, all of the facility construction and on-going impacts were related to a linear build-out over a determined period of time. To determine the different industry absorption rates, Johnson Reid evaluated case studies of large industrial expansion from around the region to determine typical absorption periods. Based on the evaluated case studies, the assumptions used in the analysis range from warehouse and distribution facilities (being absorbed by a single user at building occupancy) to 120,000 square feet per year for clean tech.

Ongoing Activity

As mentioned above, ongoing impacts were included in the model at the rate of facility construction. Direct job impacts were used as the IMPLAN input for on-going operations. Average employment densities outlined by Metro's Urban Growth Report[32] were utilized to create direct job estimates.

Fiscal Impacts

The analysis considered only taxes on real property and state payroll tax associated with payroll impact estimates outlined above.

[31] Minnesota IMPLAN Group (MIG), Inc., Stillwater, Minnesota.

[32] 14.7 jobs per acre for manufacturing; 8.8 jobs per acre for warehouse/distribution. Metro, 2009-2030 Urban Growth Report, January 2010.

Property Tax Impacts

Property tax revenues (only real property, not personal property) were calculated on the *net-new* assessed value created by facility construction. Future assessed values were estimated by applying the cost of replacement to the changed property ratio (CPR) for industrial development in each respective county. For example, in year-one if there were a $1,000,000 facility improvement on a site in Multnomah County, that increase in real market value would be multiplied by 0.876 (the industrial CPR in Multnomah County) to determine assessed value. Property taxes were estimated[33] on assessed values by the according millage rate for each site. A maximum annual assessed value increase on existing land and improvements of 3% in accordance with Measure 50 was assumed.

State Payroll Tax Impacts

State payroll taxes were applied to all taxable income[34] according to the State's current 2012 tax rates[35]. Payroll taxes were considered on payroll associated with the direct, indirect, and induced impacts of all construction and on-going operational activities.

The above discussion addresses both the development costs and fiscal impacts of the Phase 2 sites. A more complete description of the methodology is in Volume 3, Appendix L.

11. Jurisdiction Review

Similar to the Phase 1 methodology, the consultant and PMT reached out to local jurisdictions that had a Phase 2 site. In March of 2012, the Group Mackenzie provided the following information for jurisdictional review on each Phase 2 site:

1. The final concept site plan;
2. Infrastructure (water, sanitary, storm, and slope mitigation) costs with an explanation of the methodology used;
3. Transportation upgrade costs and explanation;
4. Wetland mitigation costs (provided by DSL); and
5. Brownfield remediation costs (provided by Ash Creek Associates, Inc.).

Jurisdictions were able to make suggestions on altering the concept development site plans, for example, requesting two access points to the site, or increasing building square footage, etc. Group Mackenzie made changes if deemed appropriate based on feedback.

Prior to publishing, the local jurisdictions were able to review the materials for final approval. Jurisdictions were asked to provide land owners this information for review prior to publishing. On June 7, 2012, a meeting for all project funders and local jurisdictions was held to share the results of this study.

[33] Where a site is located in an Enterprise Zone, property tax impacts are frozen for five years beginning with the first year of facility construction.

[34] Taxable income is assumed to be 75% of total payroll wage. Reduction accounts for federal withholding, standard deductions, and other miscellaneous deductions.

[35] Oregon Department of Revenue, Oregon Withholding Tax Formulas, January 2012