# Agenda

**REGULAR CITY COUNCIL WORKSHOP**
**Richland City Hall ~ 505 Swift Boulevard**
**Tuesday, September 23, 2014**

## City Council Regular Workshop, 6:00 p.m.

*(Discussion Only - City Hall Council Chamber)*

### Agenda Items:

1. Presentation by Kadlec Regional Medical Center (15 minutes)
   - Bill King, Deputy City Manager
2. Duportail Street Reconstruction Project (15 minutes)
   - Pete Rogalsky, Public Works Director
3. Street Lighting Standards (15 minutes)
   - Pete Rogalsky, Public Works Director
4. Joint Port Projects (30 minutes)
   - Bill King, Deputy City Manager
5. Proposed Hillside Regulations (20 minutes)
   - Bill King, Deputy City Manager

### Adjournment

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# Council Workshop Coversheet

Richland

Council Date: 09/23/2014

Agenda Item : W1

Key Element: Key 3 - Economic Vitality

Subject: KADLEC REGIONAL MEDICAL CENTER PRESENTATION

Department: Community and Development Services

Document Type: Presentation

Summary:

The City of Richland and Kadlec have engaged in several master planning efforts to lay out the future of Richland's downtown medical district. Kadlec and the City have worked together to implement projects such as the vacation of Goethals Drive, the new medical office building at 1100 Goethals Drive and the medical campus parking and circulation plan. Kadlec has continued its expansion and investment in Richland's Central Business District and with its recently announced partnership with Providence, Kadlec plans to continue implementing the master plan with the development of Richland's first multi-story parking structure, the expansion of the hospital tower, and a partnership with Columbia Basin College for a teaching facility that will house CBC's new paramedic training program, Kadlec's new residency program, and potentially collocate a replacement of Richland's downtown fire station.

Rand Wortman, Kadlec's President & CEO, will discuss in greater detail what their new partnership with Providence means for their projects, programs and the future of healthcare in the Tri-Cities.

Attachments:

Post Council Status: Pending

City Manager Approved: Hopkins, Marcia
Sep 18, 14:54:35 GMT-0700 2014

# Council Workshop Coversheet

Council Date: 09/23/2014

Agenda Item : W2

Key Element: Key 2 - Infrastructure & Facilities

Subject: DUPORTAIL STREET RECONSTRUCTION - INTERSECTION DESIGN

Department: Public Works

Document Type: Discussion

Summary:

The purpose of this workshop discussion is to provide Council with a preview of information to be shared in a public outreach program related to the Duportail Street Reconstruction project. The project will make street improvements to Duportail Street between Wright Avenue and Thayer Drive. Staff is preparing for open house public meetings later this fall that will seek input on design features such as sidewalk placement, bicycle lanes, on-street parking, street lighting, and intersection design.

The attached engineering report compares alternative approaches for the Wright Avenue and Thayer Drive intersections and the recommendation to use roundabouts. Staff will discuss the results of this engineering study, as well as, other street design features of interest to Council in preparation for the public involvement process.

Attachments:

Duportail Intersection Analysis - Final Tech Memo without appendixes - 9-2014

Post Council Status: Pending

City Manager Approved: Hopkins, Marcia
Sep 18, 14:54:25 GMT-0700 2014

# Duportail Street Intersection Analysis

# Results Technical Memorandum

## DRAFT FINAL

*Prepared for the*

# City of Richland, Washington

**DEA Project No. CRCH0000-0002**

***September 12, 2014***

DAVID EVANS AND ASSOCIATES INC.

*908 N. Howard Street, Suite 300*
*Spokane, WA 99207*

This technical memo summarizes the Duportail Street Intersection Analysis alternatives evaluation, the analysis methodology and assumptions and the operational analysis results. A summary of the quantitative and qualitative measures of effectiveness used to evaluate and compare the proposed intersection configuration alternatives is also included.

## Project Introduction

The focus of the Duportail Street Intersection Analysis is to evaluate the street's intersections with Wright Avenue and Thayer Drive. Currently, Duportail Street makes up the stop-controlled minor approaches at these intersections. The City of Richland is planning to extend Duportail to the southwest across the Yakima River to connect to another existing segment of Duportail as well as extend the street to the east to connect to Wellsian. These improvements are projected to shift the traffic patterns and increase traffic along Duportail Street and make it the higher volume roadway at the study intersections. The study scope includes comparison of four potential intersection control scenarios to identify the preferred improvements.

## Intersection Control, Configuration and Conceptual Design

Five intersection layouts were evaluated for each study intersection; a description of each is included below:

1. <u>Existing and No-Build:</u> At both study intersections the northbound and southbound approaches are free-flow or uncontrolled; the eastbound and westbound approaches at Wright and eastbound approach at Thayer are stop controlled.
2. <u>Two-way stop control:</u> Under 'Build' conditions, Duportail is expected to be the higher volume route and is therefore free-flow or uncontrolled while the northbound and southbound approaches are stop controlled. (Duportail is assumed to have a three lane section with a center, two-way left turn lane (TWLT) at Wright and Thayer; the Wright and Thayer approaches both have separate left turn lanes and a thru/right shared lane.
3. <u>Four-way stop control:</u> All four intersection approaches are stop controlled with separate left turn lanes and shared thru/right lanes.
4. <u>Signalized:</u> Intersection lane configuration and geometry is similar to the four-way stop control layouts except with signalized intersection control.
5. <u>Roundabout:</u> The conceptual roundabout layouts developed for the project and used for operational analysis purposes are single lane compact urban roundabouts with raised splitter islands, truck aprons and a landscaped center island. No by-pass or supplemental lanes were incorporated or deemed necessary based on the operation analysis. See below for additional roundabout design parameters and criteria.

At the Wright intersection, the potential non-roundabout configurations all call for realigning the northerly approach to reduce the skew angle as well as elimination of the sweeping, large radius corners in the northerly quadrants to create a more conventional intersection layout. At the Thayer intersection, the planned extension of Duportail to the east is included.

### Roundabout Design Criteria and Geometric Characteristics

See Appendix A for detailed criteria used for the conceptual roundabout layouts. Similar criteria was used for each intersection; one exception is that the circulating diameter for Wright intersection is 90 feet whereas the circulating diameter for Thayer is 100 feet. At each location, the following design vehicles were used: 1) School Bus (S-Bus-36), 2) WB-40 truck, and 3) City of Richland fire ladder truck (custom turning template developed). The paths and turning movements through the roundabouts were checked using AutoTurn to ensure that these vehicles can negotiate the roundabouts as designed.

Note, there are several residential driveway approaches near or within the proposed roundabouts. The driveways are noted in the roundabout layouts and the initial concept or layout for reconstruction of these driveways and maintaining site access is depicted.

Draft conceptual plan layouts of all intersection configurations are included in the appendix.

## Analysis Methodology and Assumptions

This section summarizes the analysis methodologies and assumptions used in the study. The operational analysis generally follows 2000 Highway Capacity Manual (HCM2000) methodologies as applied within Synchro v8. Roundabout scenarios were analyzed using Sidra, also using the HCM2000 methodology.

### Analysis Scenarios

The following scenarios were analyzed for each study intersection:

1. Existing Conditions (2014)
2. Existing Conditions (2015) – No-Build (Existing 2-way stop control)
3. Existing Conditions (2015) – Two-way Stop Control (N/S)
4. Existing Conditions (2015) – Four-way Stop Control
5. Existing Conditions (2015) – Traffic Signalization
6. Existing Conditions (2015) – Roundabout
7. Future Conditions (2035) – No-Build (Existing 2-way stop control)
8. Future Conditions (2035) – Two-way Stop Control (N/S)
9. Future Conditions (2035) – Four-way Stop Control
10. Future Conditions (2035) – Traffic Signalization
11. Future Conditions (2035) – Roundabout

### Traffic Volumes and Forecasting

Traffic projections were developed using the steps outlined below:

1. The City of Richland provided turning movement and ADT counts for 2014.
2. The Benton-Franklin Council of Governments (BFCOG) Travel Demand Model was used to project the link-level volumes in 2020 and 2030.
3. The 2030 link-level volumes were projected out to 2035 by using the annual growth rate between the 2020 and 2030 volumes.
4. Based on the 2035 link-level volumes, the entering turning movement volumes were calculated based on the 2014 turning movement ratios. For example, if

30% of the vehicles from one approach turned left in 2014, that percentage was assumed to turn left in 2035.

5. The turning movement volumes were manually adjusted to match the exiting volumes at an intersection. For example, there is not currently an eastbound approach at Thayer Drive. The addition of this approach drastically shifts the traffic pattern on the other approaches as projected in the modeled volumes provided by BFCOG. The volumes were adjusted until the entering volumes and exiting volumes at the approaches were calibrated to the 2035 link-level volumes.
6. For the 2015 analysis, a 1% growth rate was assumed from the 2014 base year. Additionally the volumes were manually redistributed based on the shifting of traffic patterns expected by the extension of Duportail to Wellsian.

Relevant BFCOG 2030 Model Assumptions:

- The Duportail bridge is in place
- Duportail is extended east of Thayer to connect to Wellsian
- The Stevens extension and connection to Duportail is in place

The resulting traffic volumes used for the operational analysis are shown on the following pages in Figures 1 and 2. At the top of each figure are the 2014 turning movement counts; in the middle are the projected 2015 turning movements; and at the bottom are the projected 2035 turning movement volumes. For the 2035 volumes, the shaded cells signify the projected entering and exiting volumes. The cells next to them are the volumes to be used during this study. For simplicity, the volumes were rounded to multiples of five.

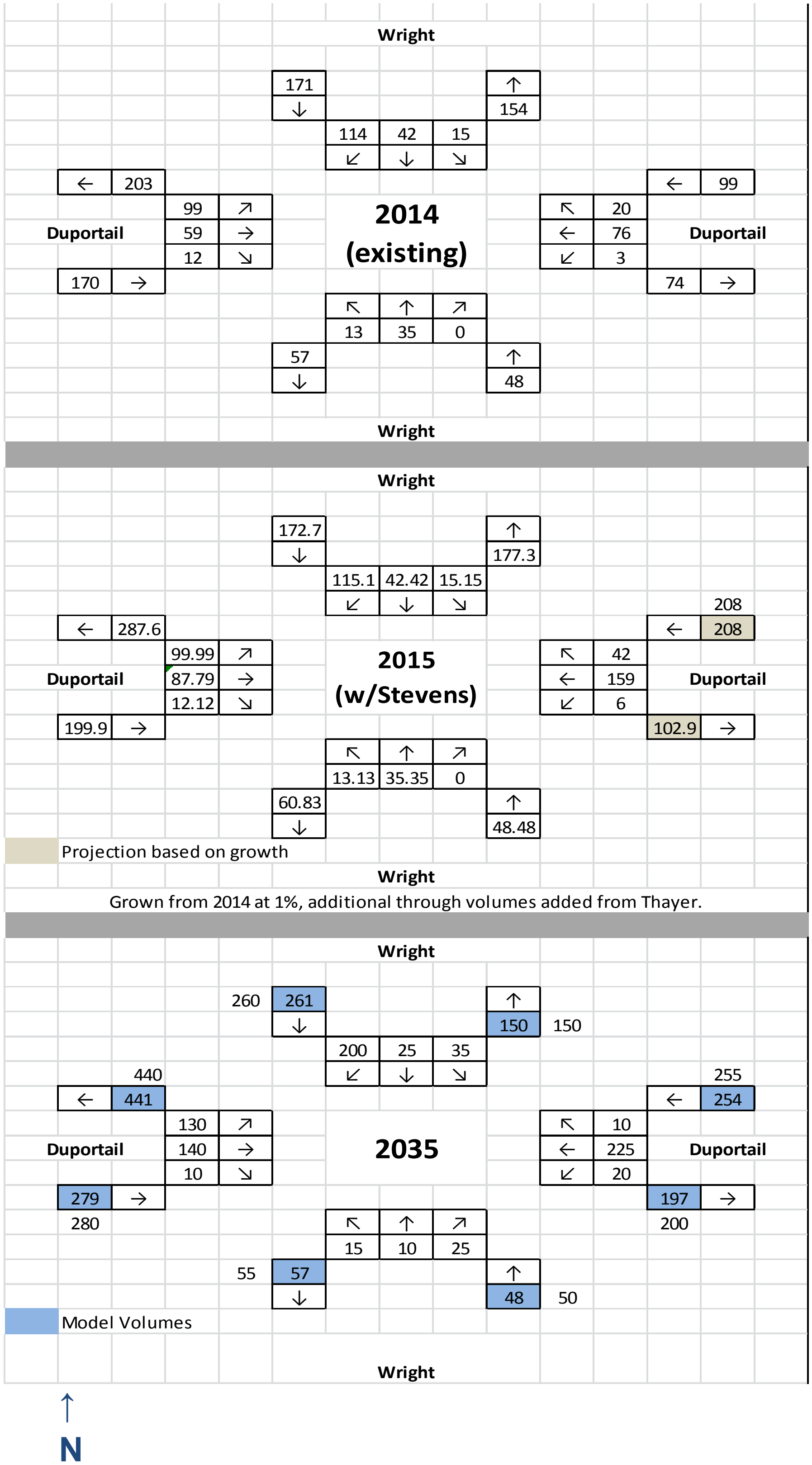



**Figure 1: Wright/Duportail 2015 and 2035 Traffic Volumes**

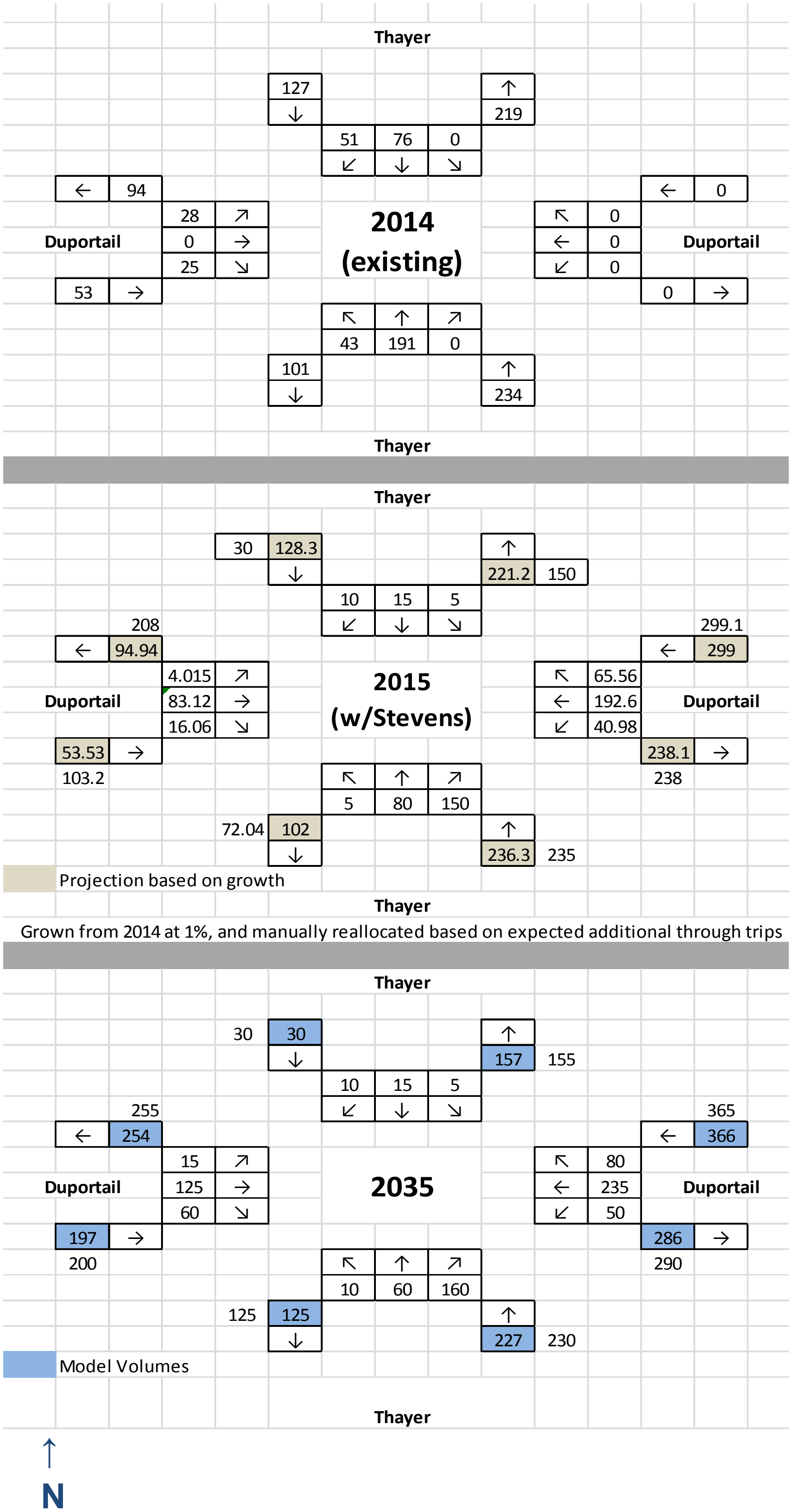



**Figure 2: Thayer/Duportail 2015 and 2035 Traffic Volumes**

**Measures of Effectiveness (MOE's)**

Both quantitative and qualitative attributes of each intersection and analysis scenario were evaluated, as listed below.

| Quantitative Measures | Qualitative Criteria |
|---|---|
| • Intersection Delay (seconds)<br>• Intersection LOS<br>• Intersection Capacity Utilization<br>• Intersection Stops<br>• Intersection Fuel Consumption (gal)<br>• Intersection CO Emissions (kg)<br>• Arterial Speed (mph)<br>• Approach Volume to Capacity (V/C)<br>• Approach Queue (feet) | • Bike and Pedestrian Accommodation<br>• Adjacent Site Impacts<br>• Neighborhood and Land Use Compatibility<br>• Traffic Calming Characteristics<br>• Right-of-Way Impacts<br>• Safety Characteristics |

Quantitative measures such as delay, LOS, V/C, and queue length are fairly standard measures reported in operational analyses and are based on standard HCM analysis methodologies. Measures such as Stops and Arterial Speed are less commonly reported; as such, some additional discussion and definition may be warranted.

Regarding 'Stops', for non-roundabout intersections analyzed, Synchro calculates the number of stopped vehicles by counting the number of delayed vehicles for each delay time and adjusting these vehicles by the following table. This is based on the assumption that vehicles being delayed less than 10 seconds do not make a full stop.

**Table 14-10 Stop Adjustment**

| Vehicle Delay(s) | Percent of Stop |
|---|---|
| 0 | 0% |
| 1 | 20% |
| 2 | 58% |
| 3 | 67% |
| 4 | 77% |
| 5 | 84% |
| 6 | 91% |
| 7 | 94% |
| 8 | 97% |
| 9 | 99% |

For the roundabout analysis conducted using the Sidra software the calculation of stops is more complicated and defined as follows. The "Total Effective Stops" calculated by Sidra are obtained by multiplying the average effective stop rate by the total demand flow rate. The "Effective Stop Rate" is the average number of stops per vehicle (considering all vehicles queued and unqueued) expressed in equivalent stop values. The number of stops includes major stop-starts (with the effect of slow-downs at the back of queue allowed), queue move-ups, and geometric stops. According to the Sidra user guide: “In gap acceptance situations, e.g. at roundabouts, the number of queue move-ups can be high due to frequent queue move-ups”.

Given the Sidra methodology for counting and calculating stops, it is difficult to compare non-roundabout and roundabout options in regards to ‘Stops’ as the Sidra methodology may produce a high ‘Stops’ value that is not indicative of the operation or efficient of the roundabout operation in comparison to the non-roundabout options.

Regarding the ‘Arterial Speed’ measure, the speeds shown in the tables are a measure of the average speed to travel east or west on Duportail within the study area and are a function of travel time along the roadway links (between intersections) and vehicular delay at the study intersections. Higher delay (more traffic congestion) at intersections will result in a lower arterial travel speed. This measure should be viewed from the standpoint of efficiency of travel along the subject corridor and is not necessarily related to excessive speeds related to a speed limit. Alternatives analyzed that have higher average speeds should not be viewed as having more ‘speeding’ through the subject neighborhood or having a greater incidence of vehicles exceeding the speed limit.

**Qualitative Measures Scoring Methodology**

The qualitative measures shown in Table 5 below use a system of scoring or evaluation broken down in to five categories: 1) Very Good, 2) Good, 3) Neutral or Moderate 4) Poor, 5) Very Poor. This scoring methodology is applied to each of the criteria. Below are considerations made for each qualitative criteria.

- Bike and Pedestrian Accommodation: Presence of bike or pedestrian facilities at each intersection and approach; ease of crossing of various intersection approaches; safety.
- Adjacent Site Impacts: Considerations include impacts to site access and driveways and site encroachment.
- Neighborhood and Land Use Compatibility: The suitability of each intersection control type given the typical single family residential land uses. As in example, traffic signals are less common in low density residential neighborhoods and are therefore considered less compatible with the neighborhood.
- Traffic Calming Benefits: Considerations included the typical impact each intersection control type may have on speed or average or typical speeds.
- Right-of-Way Impacts: The greater the Right-of-way impact or acquisition required, the lower the score.
- Safety Characteristics: The expected impact or change (positive or negative) on both the amount and severity of accidents.

## Analysis Results and Evaluation

A summary of operational analysis results and a summary of quantitative measures of effectiveness are included in Tables 1-4 later in this section.

Existing Conditions

Under existing conditions, both the Wright and Thayer intersections are functioning at LOS B; in both cases the worst movement or approach is the eastbound approach. Note that for 2-way stop controlled intersections the LOS and delay are reported for the worst approach or movement.

2015 Conditions – Wright/Duportail

The Wright/Duportail intersection was analyzed under 2015 traffic conditions for each of the four intersection configurations previously noted. The intersection will function at an acceptable level of service under all intersection configurations. The intersection will function at LOS A under the 4-way stop, signalized and roundabout configurations; and LOS C under 2-way stop (N-S stop controlled) and LOS B under the existing configuration. Note that while the intersection functions acceptably as a signalized intersection, it does not meet signal warrants based on 2015 volumes.

2015 Conditions – Thayer/Duportail

The Thayer/Duportail intersection was analyzed under 2015 traffic conditions for each of the four intersection configurations previously noted. The intersection will function at an acceptable level of service under all intersection configurations. The intersection will function at LOS A under the 4-way stop, signalized and roundabout configurations and at LOS B under each 2-way stop configuration. Note that while the intersection functions acceptably as a signalized intersection, it does not meet signal warrants based on 2015 volumes.

The MUTCD recommends that 4-way stops be installed as an interim measure prior to installation of a traffic signal; since signal warrants are not met, the 4-way stop control configurations should also be removed from consideration.

Given the removal of the 4-way stop configuration, the 2-way stop (N/S) and roundabout configurations are the most viable options. In comparing the quantitative measures for these two intersection control options under 2015 conditions, both function similarly in most categories or measures while the Roundabout option provides a better LOS and creates less queuing.

| Intersecting Street | 2014 Existing | 2015 Existing Control 2-Way Stop (E/W) | 2015 2-Way Stop (N/S) | 2015 4-Way Stop | 2015 Signal | 2015 Round-about |
|---|---|---|---|---|---|---|
| **Intersection Delay (sec/veh)** | | | | | | |
| @ Wright | 6.6 | 8.3 | 5.8 | 8.4 | 5.6 | 6.4 |
| @ Thayer | 2.3 | 7.8 | 5.2 | 9.8 | 6.2 | 6.1 |
| **Intersection LOS** | | | | | | |
| @ Wright | B | B | C* | A | A | A |
| @ Thayer | B | B | B* | A | A | A |
| **Intersection Utilization (%)** | | | | | | |
| @ Wright | 32% | 40% | 35% | 35% | 38% | 43% |
| @ Thayer | 35% | 35% | 34% | 34% | 34% | 44% |
| **Intersection Stops** | | | | | | |
| @ Wright | 299 | 440 | 388 | 628 | 264 | 377 |
| @ Thayer | 118 | 417 | 333 | 667 | 278 | 348 |
| **Intersection Fuel Consumption (gal)** | | | | | | |
| @ Wright | 5 | 6 | 6 | 7 | 5 | 6 |
| @ Thayer | 3 | 11 | 11 | 13 | 10 | 12 |
| **Intersection CO Emission (kg)** | | | | | | |
| @ Wright | 0.35 | 0.45 | 0.42 | 0.5 | 0.38 | 0.43 |
| @ Thayer | 0.19 | 0.78 | 0.76 | 0.9 | 0.73 | 0.81 |
| **Arterial Speed (mph)** | | | | | | |
| EB | 16.1 | 15.6 | 28.6 | 18.1 | 20.4 | 21.7 |
| WB | 18.1 | 18.4 | 25.1 | 19.7 | 20.8 | 21.6 |

* : Level of service for 2-way stop control is based on the worst approach

**Table 1: Existing and 2015 Intersection Operational Analysis Results**

| Measure of Effectiveness | | 2014 | 2015 | | | | |
|---|---|---|---|---|---|---|---|
| | | Existing | Existing Control 2-Way Stop (E/W) | 2-Way Stop (N/S) | 4-Way Stop | Signal | Round-about |
| **Wright Avenue Intersection** | | | | | | | |
| Approach v/c (highest mvmt) | EB | 0.26 | 0.34 | 0.08 | 0.18 | 0.2 | 0.21 |
| | WB | 0.12 | 0.25 | 0.03 | 0.27 | 0.23 | 0.26 |
| | NB | 0.01 | 0.01 | 0.1 | 0.06 | 0.1 | 0.07 |
| | SB | 0.07 | 0.07 | 0.15 | 0.17 | 0.21 | 0.23 |
| Approach Queue (highest mvmt) | EB | 72' | 84' | 40' | 35' | 56' | 33' |
| | WB | 49' | 70' | 8' | 61' | 91' | 40' |
| | NB | | 7' | 40' | 41' | 53' | 8' |
| | SB | 9' | | 49' | 52' | 66' | 35' |
| **Thayer Drive Intersection** | | | | | | | |
| Approach v/c (highest mvmt) | EB | 0.08 | 0.18 | 0.06 | 0.17 | 0.11 | 0.11 |
| | WB | - | 0.4 | 0.17 | 0.41 | 0.31 | 0.32 |
| | NB | 0.03 | 0 | 0.33 | 0.36 | 0.32 | 0.26 |
| | SB | 0.08 | 0 | 0.04 | 0.04 | 0.05 | 0.04 |
| Approach Queue (highest mvmt) | EB | 58' | 49' | | 62' | 51' | 15' |
| | WB | | 96' | 24' | 103' | 102' | 54' |
| | NB | 41' | 10' | 86' | 72' | 84' | 40' |
| | SB | | 18' | 46' | 46' | 40' | 5' |

**Table 2: Existing and 2015 V/C Ratio and Queuing by Approach**

<u>2035 Conditions – Wright/Duportail</u>
The Wright/Duportail intersection was analyzed under 2035 traffic conditions for each of the four intersection configurations previously noted. The intersection will function at an acceptable level of service under all intersection configurations. The intersection will function at LOS C under each 2-way stop control configuration, LOS B under 4-way stop control configuration, and LOS A under signalized and roundabout intersection control. Note that while the intersection functions acceptably as a signalized intersection, it does not meet signal warrants based on 2035 volume projections. Further note that the MUTCD recommends that 4-way stops be installed as an interim measure prior to installation of a traffic signal; since signal warrants are not met, the 4-way stop control configuration should also be removed from consideration.

<u>2035 Conditions – Thayer/Duportail</u>

The Thayer/Duportail intersection was analyzed under 2035 traffic conditions for each of the four intersection configurations previously noted. The intersection will function at an acceptable level of service under all intersection configurations. The intersection will function at LOS C under each 2-way stop control configuration, LOS B under a 4-way stop control configuration, and LOS A under signalized and roundabout intersection control. Note that while the intersection functions acceptably as a signalized intersection, it does not meet signal warrants based on 2035 volume projections. Signal warrant evaluation tables are included in the appendix. Further note that the MUTCD recommends that 4-way stops be installed as an interim measure prior to installation of a traffic signal; since signal warrants are not met, the 4-way stop control configuration should also be removed from consideration.

With the signalized and 4-way Stop options eliminated from consideration, the 2-way Stop (N/S) and Roundabout configurations are the most viable options.

Upon examination of the operational analysis results, for these two intersection control options, both function similarly in most categories or measures while the Roundabout option provides a better LOS under both 2015 and 2035 conditions and causes less approach queuing under near term (2015) conditions.

| Intersecting Street | 2035 | | | | |
|---|---|---|---|---|---|
| | Existing Control 2-Way Stop (E/W) | 2-Way Stop (N/S) | 4-Way Stop | Signal | Round-about |
| **Intersection Delay (sec/veh)** | | | | | |
| @ Wright | 10.6 | 6.8 | 10.4 | 5.8 | 8 |
| @ Thayer | 9.8 | 4.5 | 11 | 15.1 | 6.7 |
| **Intersection LOS** | | | | | |
| @ Wright | C | C* | B | A | A |
| @ Thayer | B | B* | B | B | A |
| **Intersection Utilization (%)** | | | | | |
| @ Wright | 48% | 41% | 41% | 43% | 56% |
| @ Thayer | 44% | 44% | 44% | 44% | 53% |
| **Intersection Stops** | | | | | |
| @ Wright | 575 | 555 | 846 | 355 | 556 |
| @ Thayer | 588 | 362 | 825 | 501 | 444 |
| **Intersection Fuel Consumption (gal)** | | | | | |
| @ Wright | 9 | 8 | 10 | 7 | 8 |
| @ Thayer | 14 | 12 | 16 | 15 | 14 |
| **Intersection CO Emission (kg)** | | | | | |
| @ Wright | 0.62 | 0.57 | 0.69 | 0.5 | 0.57 |
| @ Thayer | 0.98 | 0.85 | 1.09 | 1.05 | 0.96 |
| **Arterial Speed** | | | | | |
| EB | 14 | 26 | 16.2 | 15.3 | 19.8 |
| WB | 17.5 | 23.7 | 17.9 | 18.1 | 20.3 |
| | * : Level of service for 2-way stop control is based on the worst approach | | | | |

**Table 3: 2035 Intersection Operational Analysis Results**

| Measure of Effectiveness | | 2035 Existing Control 2-Way Stop (E/W) | 2035 2-Way Stop (N/S) | 2035 4-Way Stop | 2035 Signal | 2035 Round-about |
|---|---|---|---|---|---|---|
| **Wright Avenue Intersection** | | | | | | |
| Approach v/c (highest mvmt) | EB | 0.54 | 0.11 | 0.26 | 0.27 | 0.3 |
| | WB | 0.39 | 0.02 | 0.44 | 0.29 | 0.33 |
| | NB | 0.01 | 0.12 | 0.06 | 0.06 | 0.08 |
| | SB | 0.13 | 0.28 | 0.33 | 0.21 | 0.39 |
| Approach Queue (highest mvmt) | EB | 93' | 38' | 53' | 71' | 51' |
| | WB | 109' | 15' | 83' | 99' | 53' |
| | NB | 7' | 35' | 36' | 35' | 10' |
| | SB | | 91' | 77' | 78' | 65' |
| **Thayer Drive Intersection** | | | | | | |
| Approach v/c (highest mvmt) | EB | 0.34 | 0.12 | 0.31 | 0.44 | 0.21 |
| | WB | 0.48 | 0.20 | 0.51 | 0.58 | 0.38 |
| | NB | 0.01 | 0.33 | 0.37 | 0.32 | 0.28 |
| | SB | 0.00 | 0.05 | 0.05 | 0.06 | 0.05 |
| Approach Queue (highest mvmt) | EB | 81' | | 72' | 126' | 32' |
| | WB | 109' | 28' | 96' | 157' | 69' |
| | NB | 14' | 74' | 64' | 107' | 44' |
| | SB | 14' | 38' | 40' | 41' | 6' |

**Table 4: 2035 V/C ration and Queuing by Approach**

## <u>Qualitative Measures of Effectiveness (MOE's) and Alternatives Comparison</u>

Several qualitative measures were chosen to assist in comparing and evaluating the alternative intersection configurations. These measures include: 1) Bike/Pedestrian Accommodation; 2) Site Impacts; 3) Neighborhood and Land Use Compatibility; 4) Traffic Calming Benefits; 5) Right-of-way Impacts; 6) Safety Characteristics.

The Qualitative MOE's and Alternative Comparison are summarized in Table 5 below and a discussion of the scoring of the alternatives follows the table.

| Intersecting Street | Qualitative Measures | | | | |
|---|---|---|---|---|---|
| | Existing Control | 2-Way Stop (N/S) | 4-Way Stop | Signal | Round-about |
| **Bicycle and Pedestrian Accomodation** | | | | | |
| @ Wright | Moderate/Neutral | Poor | Moderate/Neutral | Moderate/Neutral | Good |
| @ Thayer | Moderate/Neutral | Poor | Moderate/Neutral | Moderate/Neutral | Good |
| **Adjacent Site Impacts** | | | | | |
| @ Wright | Very Good | Very Good | Very Good | Moderate/Neutral | Poor |
| @ Thayer | Very Good | Good | Good | Moderate/Neutral | Moderate/Neutral |
| **Neighborhood and Land Use Compatibility** | | | | | |
| @ Wright | Moderate/Neutral | Moderate/Neutral | Moderate/Neutral | Poor | Good |
| @ Thayer | Moderate/Neutral | Moderate/Neutral | Moderate/Neutral | Moderate/Neutral | Good |
| **Traffic Calming Benefit** | | | | | |
| @ Wright | Good | Moderate/Neutral | Good | Poor | Very Good |
| @ Thayer | Good | Moderate/Neutral | Good | Poor | Very Good |
| **Right-of-Way Impacts** | | | | | |
| @ Wright | Very Good | Very Good | Very Good | Very Good | Moderate/Neutral |
| @ Thayer | Good | Good | Good | Good | Moderate/Neutral |
| **Safety Characteristics** | | | | | |
| @ Wright | Moderate/Neutral | Moderate/Neutral | Good | Moderate/Neutral | Good |
| @ Thayer | Moderate/Neutral | Moderate/Neutral | Good | Moderate/Neutral | Good |

| | |
|---|---|
| Very Good | (solid green circle) |
| Good | (half green circle) |
| Moderate/Neutral | (empty circle) |
| Poor | (half red circle) |
| Very Poor | (solid red circle) |

**Table 5: Qualitative MOE's**

As noted earlier, the intersections do not meet traffic signal warrants under 2015 or 2035 conditions and 4-way stop control is typically recommended to be used as an interim measure before installing a traffic signal; as such the two alternatives should be dropped from consideration.

The two remaining and most viable alternatives are the 2-way stop and roundabout alternatives. In comparing the qualitative scoring of the these two alternatives, the Roundabout alternative scores better overall than the 2-way stop alterative. The roundabout alternative provides better accommodation of bikes and pedestrians via marked and designated crossings, whereas bikes and pedestrians are required to cross the two uncontrolled (no stops) legs of each intersection. The 2-way stop has less Site and Right-of-Way impacts than the roundabout alternative due to the greater size or footprint of the roundabout. Roundabouts are regarded as more compatible with low density residential land uses such as the study area and typically provide a Traffic Calming benefit desired by residential neighborhoods.

Finally, regarding Safety, roundabouts generally reduce the severity of accidents compared to most other intersection configuration alternatives and pedestrian safety is improved due to the lower vehicular speeds through the intersection and shorter crossing distances. Note, existing accident data for the subject intersections is included in the appendix for reference purposes. No accident data analysis was conducted as part of this study.

**Bike and Pedestrian Background and Considerations**

Given the residential nature of the study area and proximity to several schools, there is a high degree of pedestrian traffic in the area. There are existing marked crosswalks within the study area at the Duportail/Sanford intersection; east of the Wright intersection, and at the Wright intersection. As part of the planned improvements to the Duportail corridor it is expected that pedestrian crossing treatments at Sanford and the crossing of Duportail just east of Wright will remain or be replaced in some fashion. Depending on the intersection control chosen and constructed for the Thayer and Wright intersections, appropriate pedestrian crossing treatments are anticipated to address the high pedestrian and bike traffic.

## Summary and Conclusions

The Wright/Duportail and Thayer/Duportail intersections were evaluated under existing conditions and four intersection configurations alternatives under existing, 2015, and 2035 traffic conditions.

Each intersection generally functions at an acceptable LOS. However, signal warrants are not met for either study intersection under near term or 2035 projected traffic conditions. Furthermore, the MUTCD recommends that 4-Way stop intersection control be used as an interim measure prior to installation of traffic signals. As such, the signalization and 4-way stop alternatives should be removed from further consideration.

Based on the operational analysis results and consideration of qualitative criteria and MOE's it appears that the roundabout intersection configuration is the preferable configuration. Compared to the stop controlled configurations, the roundabouts will provide superior traffic operations and provide for superior traffic calming and safety benefits while being compatible with the surround neighborhood and land uses.

Additionally, the roundabout intersection configurations will provide more reserve capacity than the stop controlled configurations and adjust to and accommodate changes in traffic volumes as future improvements are implemented such as the Duportail Bridge and Stevens extension and connection to Duportail.

## Appendices

- **Appendix A: Roundabout Design Criteria**
- **Appendix B: Intersection Layouts**
- **Appendix C: Operational Analysis Output Reports (Sychnro and Sidra)**
- **Appendix D: Signal Warrants**
- **Appendix E: Accident Data**

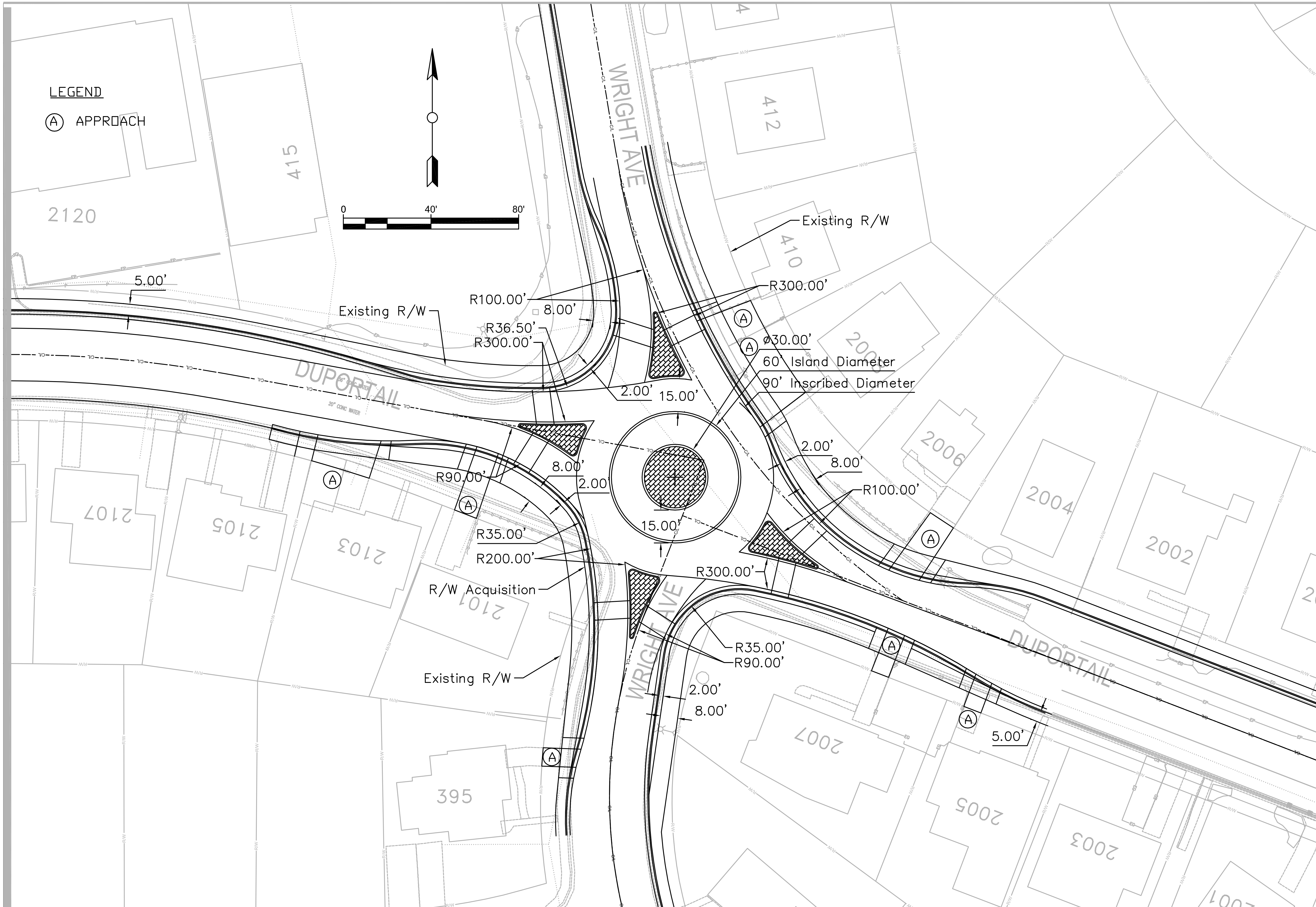
# Appendix A: Roundabout Design Criteria

## Duportail Roundabout Design Criteria*

| | Wright | | | | | Thayer | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Leg | | | | | Leg | | | |
| **Criteria** | ***General*** | ***North*** | ***East*** | ***South*** | ***West*** | ***General*** | ***North*** | ***East*** | ***South*** | ***West*** |
| **Design Class** | Single Lane Urban Roundabout | | | | | Single Lane Urban Roundabout | | | | |
| **Design Year** | 2035 | | | | | 2035 | | | | |
| **Design Speed** | | 25mph | 25mph | 25mph | 25mph | | 30mph | 25mph | 30mph | 25mph |
| **ADT** | 7000VPD | | | | | 7000VPD | | | | |
| **Percent Trucks** | 2% | | | | | 2% | | | | |
| **Design Vehicle** | S-Bus-36, WB-40, and CR Ladder Truck | | | | | S-Bus-36, WB-40, and CR Ladder Truck | | | | |
| **Island Diameter** | 30' | | | | | 40' | | | | |
| **Insribed Diameter** | 60' | | | | | 70' | | | | |
| **Circulating Roadway Width** | 15' | | | | | 15' | | | | |
| **Outside Circulation Diameter** | 90' | | | | | 100' | | | | |
| **Entry/Exit Width** | | 12' | 12' | 12' | 12' | | 12' | 12' | 12' | 12' |
| **Truck Apron Width** | 15' | | | | | 15' | | | | |
| **Superelevation** | 2% Assumed | | | | | 2% Assumed | | | | |
| **Entrance Radius** | | 100' | 100' | 90' | 90' | | 90' | 90' | 100' | 100' |
| **Entrance Angle (Acute)** | | 24d | 30d | 29d | 33d | | 30d | 32d | 30d | 30d |
| **Exit Radius** | | 300' | 300' | 200' | 300' | | 300' | 200' | 200' | 300' |
| **Exit Angle (Acute)** | | 36d | 37d | 35d | 35d | | 39d | 38d | 37d | 37d |
| **Sidewalk Width** | 5' | 5' | 5' | 5' | 5' | 5' | 5' | 5' | 5' | 5' |
| **Slip Lanes** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **Crosswalk Distance from Roundabout** | 20' | 20' | 20' | 20' | 20' | 20' | 20' | 20' | 20' | 20' |
| **Control** | Yield | Yield | Yield | Yield | Yield | Yield | Yield | Yield | Yield | Yield |
| **Return Radius Between Approaches** | 35' | 35' | 35' | 35' | 35' | 35' | 35' | 35' | 35' | 35' |

***Note: This criteria is based on what is shown in the concept layouts. Actually criteria, dimensions, and final layout will require additional study. Efforts include determining the circulating speed, path radii, grading, etc.**

## Appendix B: Intersection Layouts




WRIGHT AND DUPORTAIL ROUNDABOUT

DUPORTAIL STREET ANALYSIS

CITY OF RICHLAND
RICHLAND, WA

DAVID EVANS AND ASSOCIATES INC.
908 N. HOWARD, SUITE 300
SPOKANE, WA 99201
Phone: 509.327.8697

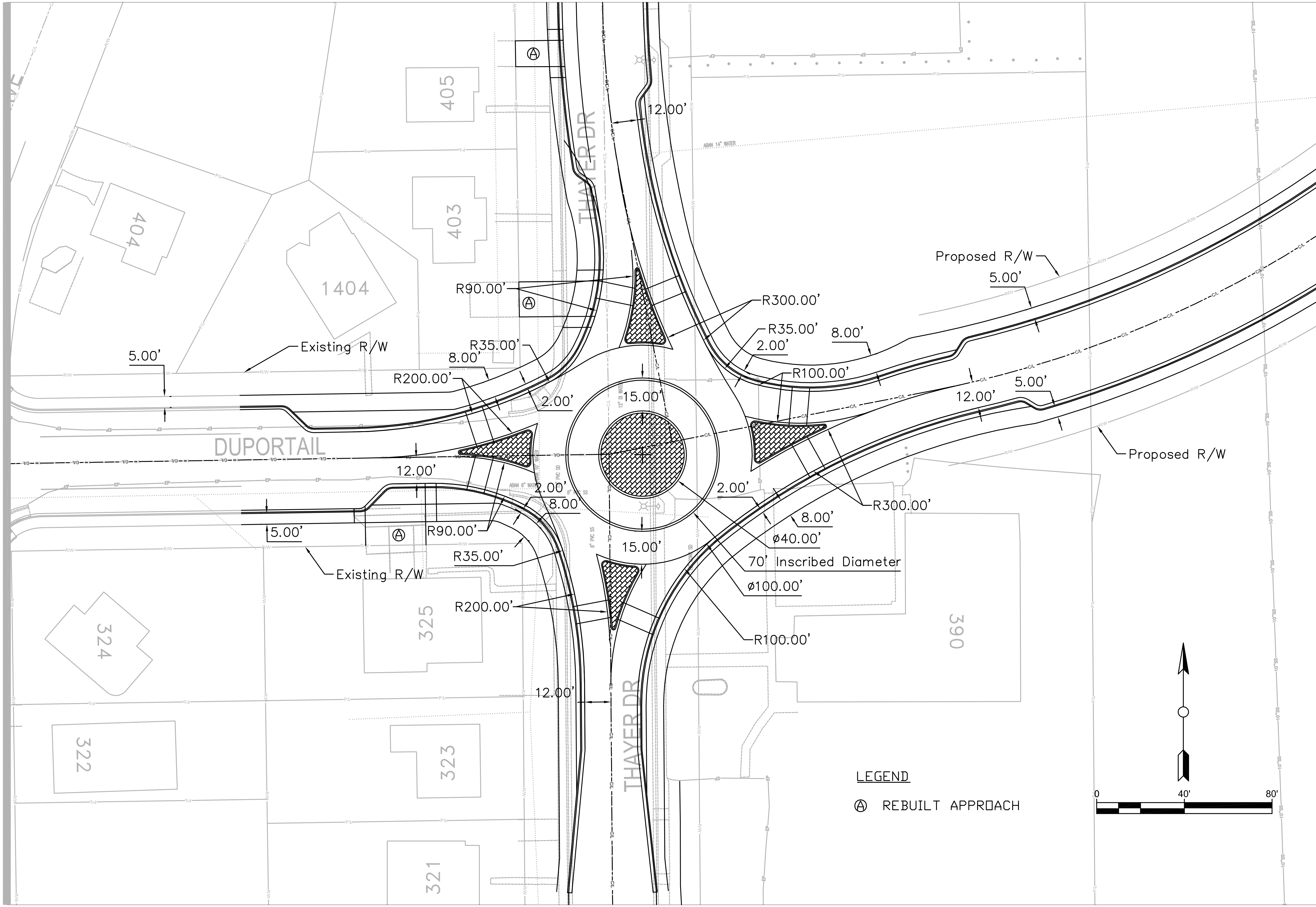
| REVISIONS: | APPD. |
|---|---|
| | |

DATE: September 3, 2014
DESIGN: RJLE
DRAWN: RJLE
CHECKED:
REVISION NUMBER:

SCALE: 1"=40'

PROJECT NUMBER:
CRCH0000-0002

SHEET NO.
1
OF 8




THAYER AND DUPORTAIL ROUNDABOUT

DUPORTAIL STREET ANALYSIS

CITY OF RICHLAND
RICHLAND, WA

DAVID EVANS AND ASSOCIATES INC.
908 N. HOWARD, SUITE 300
SPOKANE, WA 99201
Phone: 509.327.8697

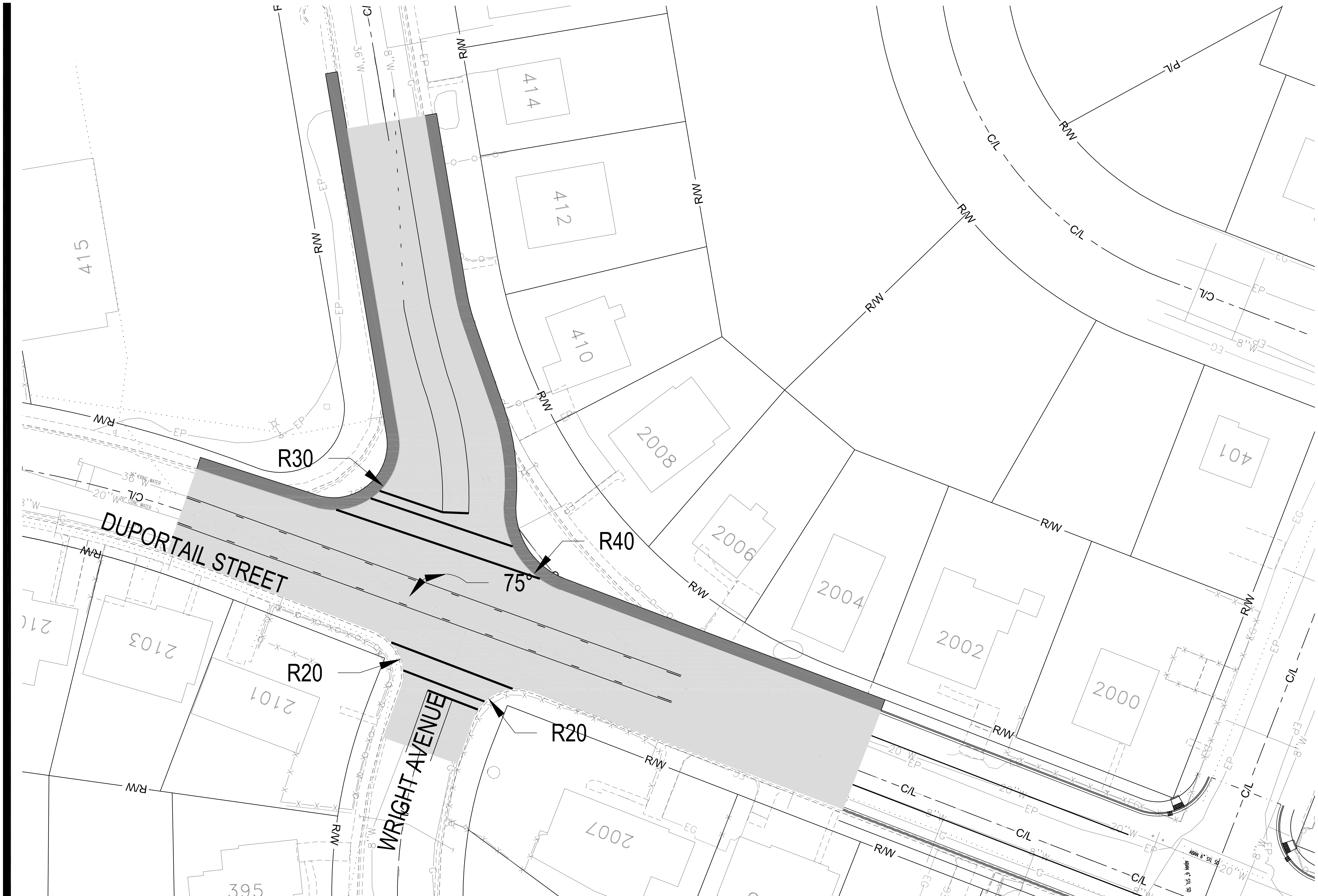
REVISIONS: APPD.

DATE: September 3, 2014
DESIGN: RJLE
DRAWN: RJLE
CHECKED:
REVISION NUMBER:

SCALE: 1"=40'

PROJECT NUMBER:
CRCH0000-0002

SHEET NO.
2
OF 8




WRIGHT AND DUPORTAIL 2-WAY STOP

DUPORTAIL STREET ANALYSIS

CITY OF RICHLAND
RICHLAND, WA

REVISIONS: APPD.

DATE: AUGUST 13, 2014
DESIGN: JECL
DRAWN: JECL
CHECKED:
REVISION NUMBER:

SCALE: 1"=40'

PROJECT NUMBER:
CRCH0000-0002

SHEET NO.

OF 5

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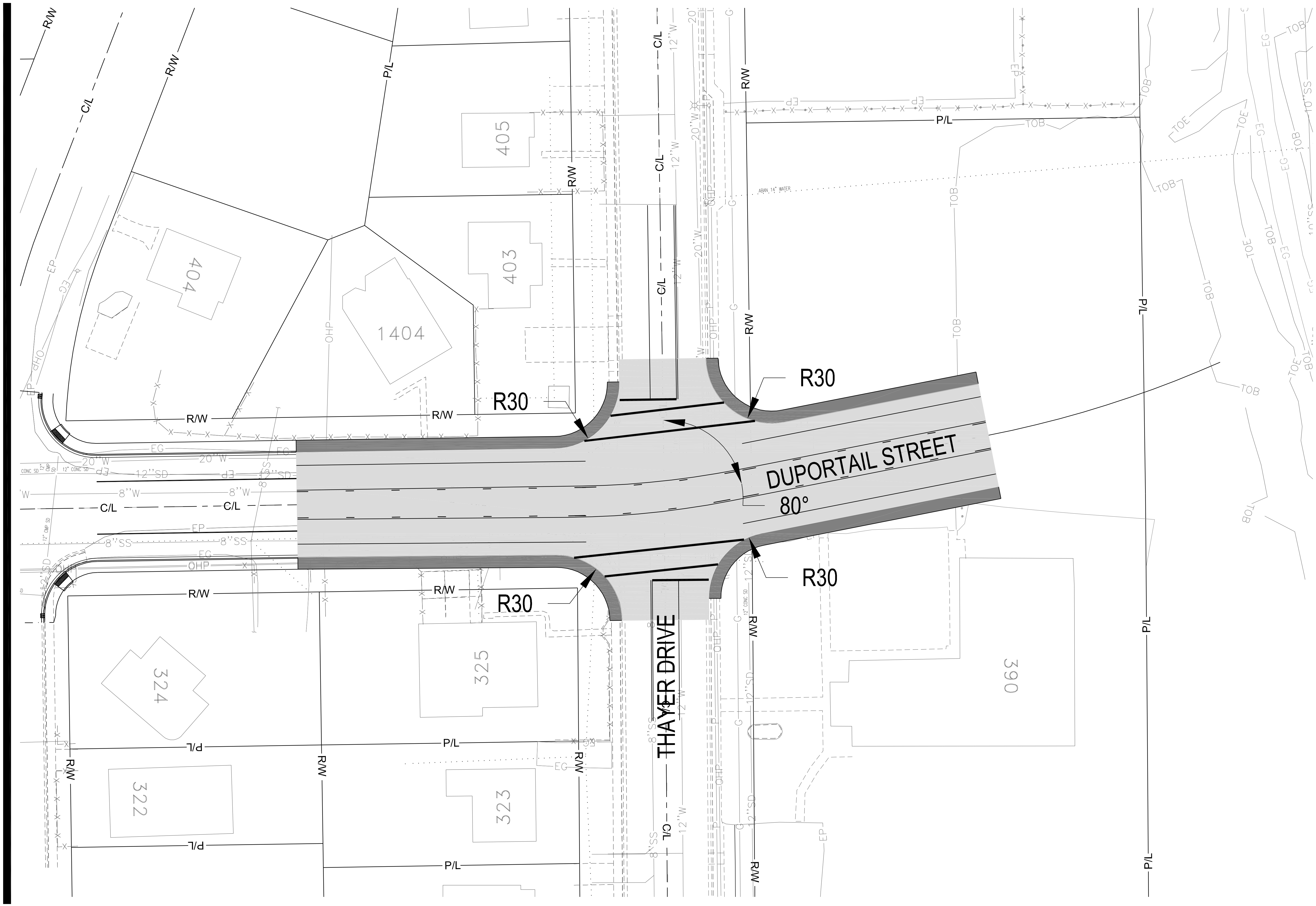


THAYER AND DUPORTAIL 2-WAY STOP

DUPORTAIL STREET ANALYSIS

CITY OF RICHLAND
RICHLAND, WA

REVISIONS: APPD.

DATE: AUGUST 13, 2014
DESIGN: JECL
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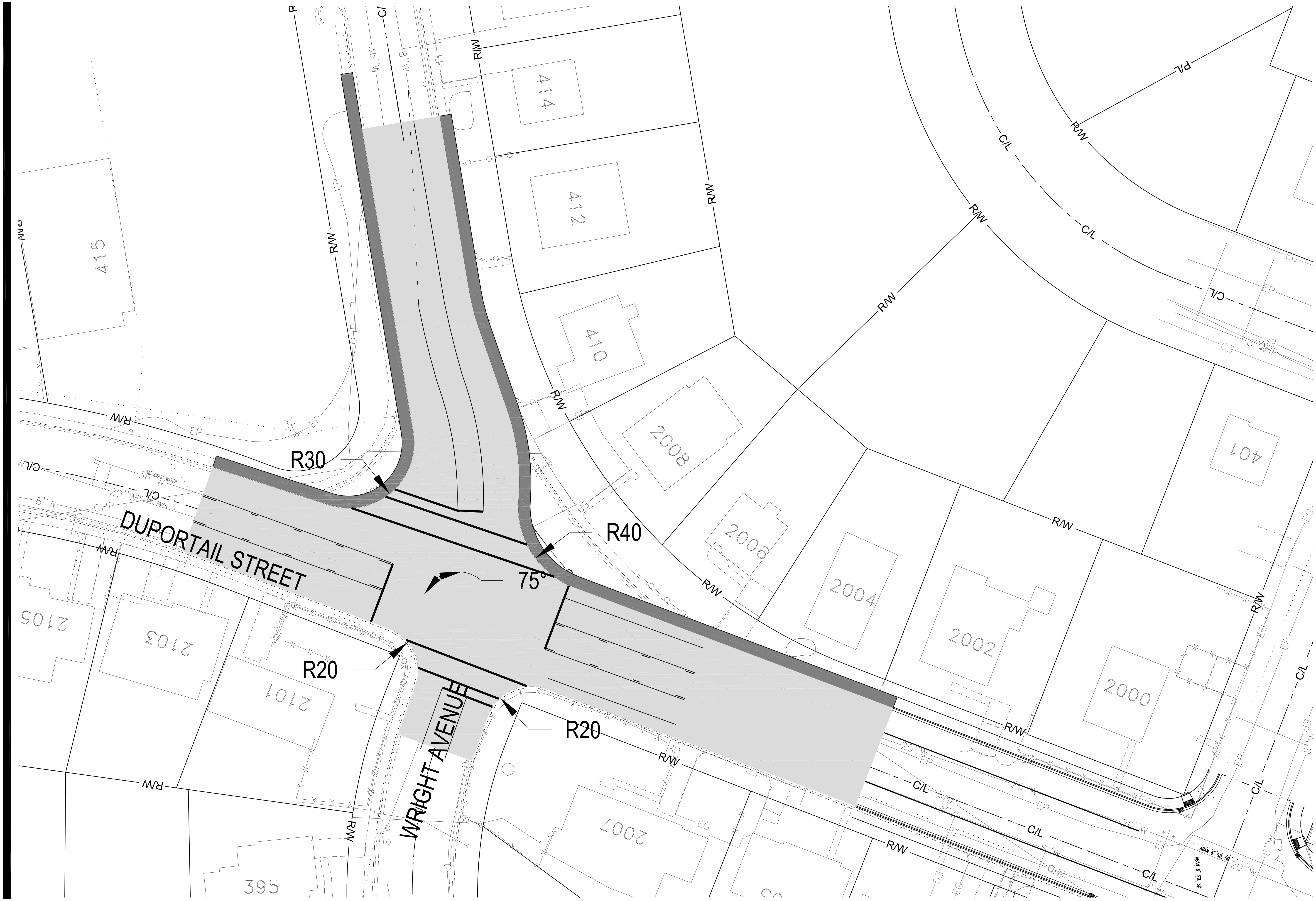
PROJECT NUMBER:
CRCH0000-0002

SHEET NO.

of 5

Plot Date: 9/12/2014 1:07 PM By: Jeremy Clark
Save Date: 8/15/2014 5:41 PM By: Jecl File: P:\C\CRCH00000002\0400CAD\BASES\CADD_Files\Two-Way-Stop-Layout2.dwg




# WRIGHT AND DUPORTAIL 4-WAY STOP

# DUPORTAIL STREET ANALYSIS

CITY OF RICHLAND
RICHLAND, WA

| REVISIONS: | APPD. |
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DATE: AUGUST 13, 2014
DESIGN: JECL
DRAWN: JECL
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REVISION NUMBER:

SCALE: 1"=40'

PROJECT NUMBER:
CRCH0000-0002

SHEET NO.

OF 5

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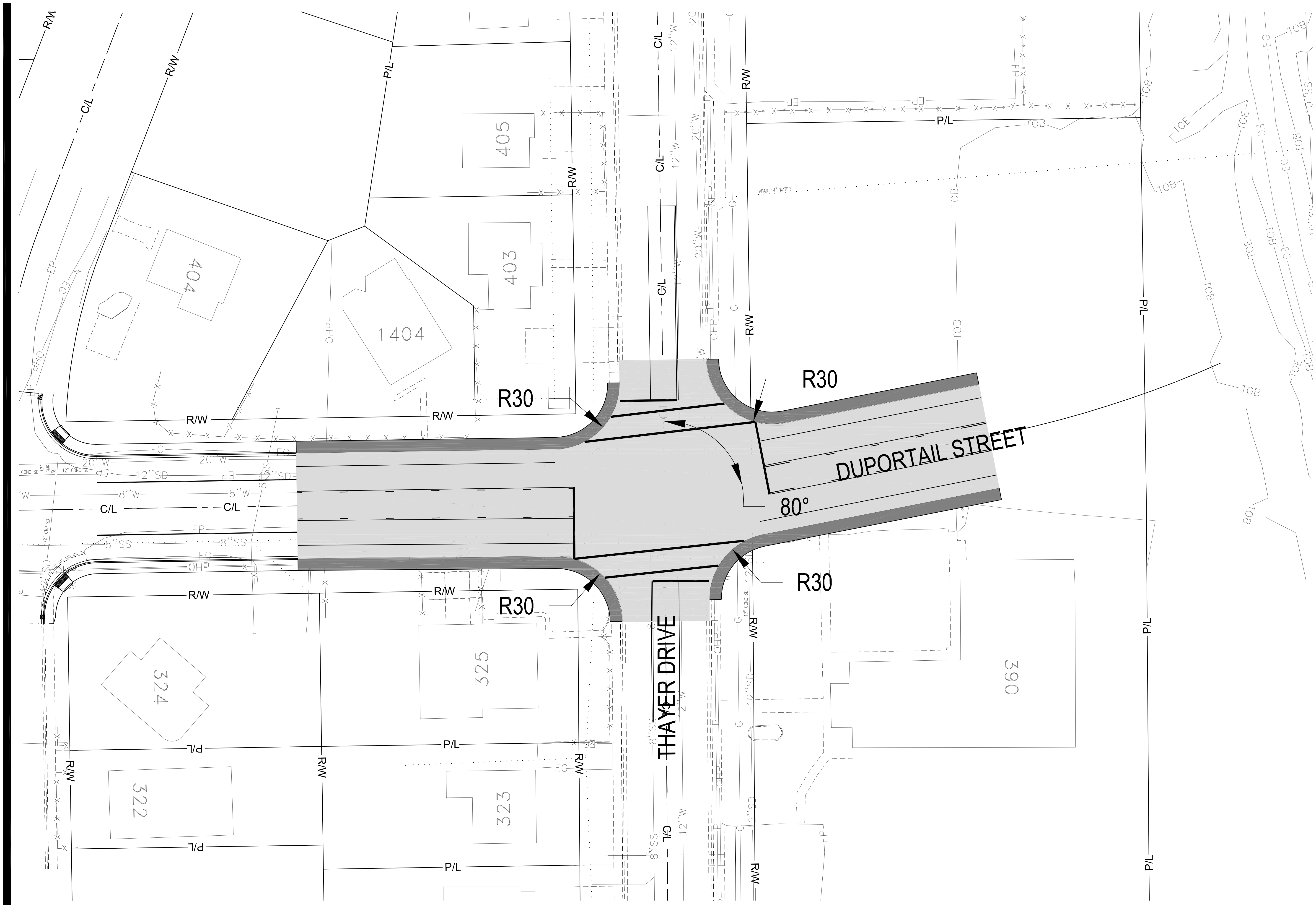


THAYER AND DUPORTAIL 4-WAY STOP

# DUPORTAIL STREET ANALYSIS

CITY OF RICHLAND
RICHLAND, WA

| REVISIONS: | APPD. |
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**DRAWN:** JECL
**CHECKED:**
**REVISION NUMBER:**

**SCALE:** 1"=40'

**PROJECT NUMBER:**
CRCH0000-0002

**SHEET NO.**

**OF** 5

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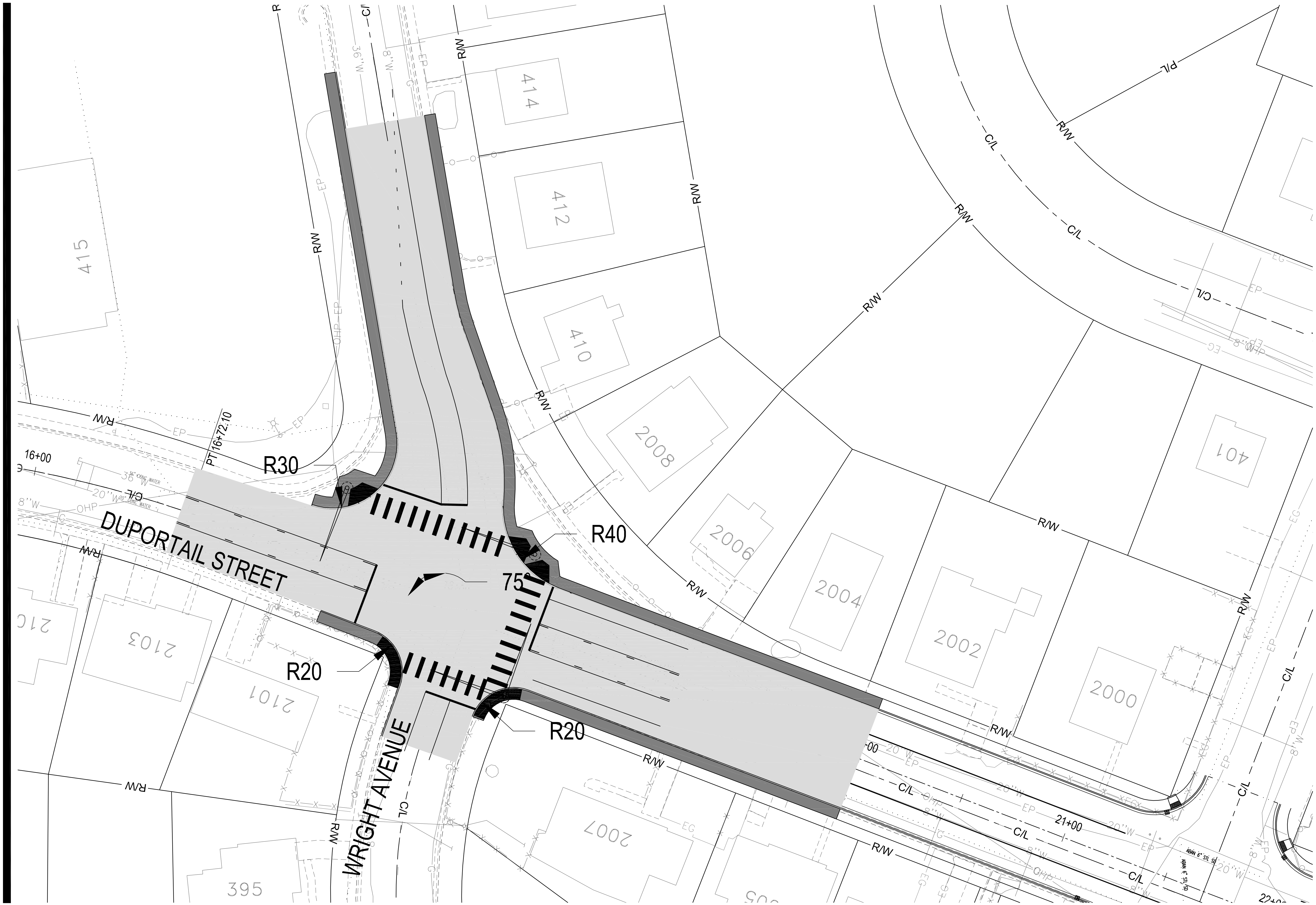


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WRIGHT AND DUPORTAIL SIGNAL

DUPORTAIL STREET ANALYSIS

CITY OF RICHLAND
RICHLAND, WA

| REVISIONS: | APPD. |
|---|---|
| | |

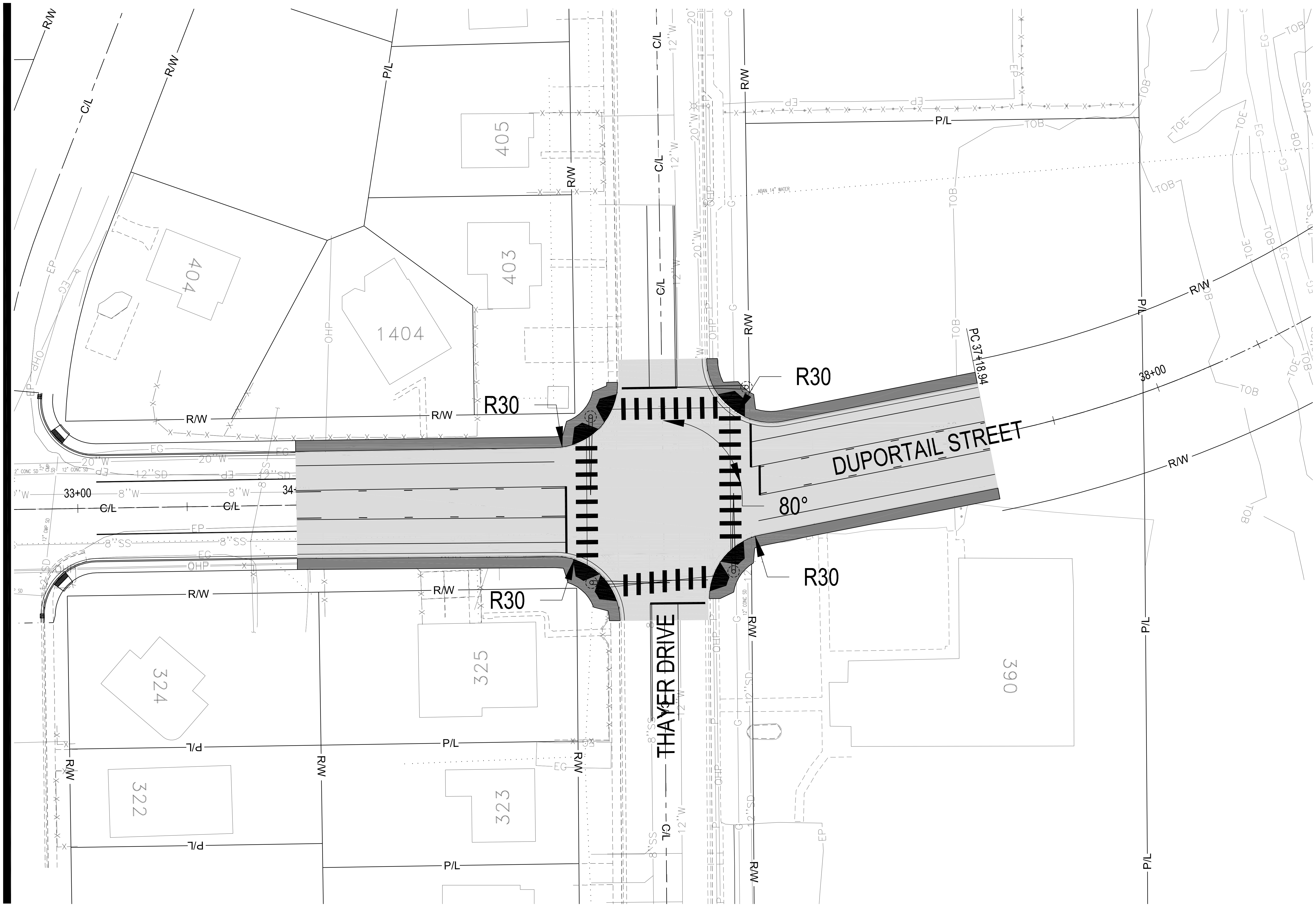
DATE: AUGUST 13, 2014
DESIGN: JECL
DRAWN: JECL
CHECKED:
REVISION NUMBER:

SCALE: 1"=40'

PROJECT NUMBER:
CRCH0000-0002

SHEET NO.

of 5




# THAYER AND DUPORTAIL SIGNAL

# DUPORTAIL STREET ANALYSIS

CITY OF RICHLAND
RICHLAND, WA

**REVISIONS:** **APPD.**

**DATE:** AUGUST 13, 2014
**DESIGN:** JECL
**DRAWN:** JECL
**CHECKED:**
**REVISION NUMBER:**

**SCALE:** 1"=40'

**PROJECT NUMBER:**
CRCH0000-0002

**SHEET NO.**

**OF** 5

Plot Date: 9/12/2014 1:14 PM By: Jeremy Clark
Save Date: 8/15/2014 4:15 PM By: Jecl File: P:\C\CRCH00000002\0400CAD\BASES\CADD_Files\Signal-Layout.dwg

# Council Workshop Coversheet

Council Date: 09/23/2014

Agenda Item : W3

Key Element: Key 2 - Infrastructure & Facilities

Subject: STREET LIGHT STANDARDS

Department: Public Works

Document Type: Discussion

Summary:


The purpose of this workshop discussion is to present staff's analysis in support of a revision to the City's street lighting standards and to solicit Council input in advance of staff presenting a resolution to Council in support of the new standards.

Over the past few years, staff and Council members have received numerous solicitations aimed at retrofitting the City's street lighting system with different technology lighting fixtures. The proposals include a promise of cost savings, either in the form of reduced energy usage or reduced maintenance effort, or both. State and federal grant programs have been launched to support conversion of street lighting systems. Staff analysis suggested that the earlier proposals may not have provided significant value to Richland, but that several of the promoted lighting technologies warranted more detailed analysis.

Staff has advanced its analysis through several efforts. The first was a pilot street lighting project completed in the first new subdivision in the Badger Mountain South development. The City, through its Electric Utility energy conservation program, invested funds to support installation of an engineered Light Emitting Diode (LED) technology lighting system that included a remote monitoring and control system. The system was energized in November 2013, and has since provided empirical experience with this technology, including the control system.

The second effort involved an engineering review of the City's most recent lighting standards document used to direct the design of new lighting in new development and City street improvements. This review revealed that the City's current standards are out of date with more recent state and federal guidance. The engineering review suggests new light level standards conforming to state and federal guidance. In addition, the review evaluates the ability of LED lighting technology to satisfy the recommended light levels and the cost of LED lighting technology when compared to the City's current high pressure sodium lighting technology.

A third effort involves a public outreach program to solicit public input comparing several available lighting technologies currently in use in the Tri-Cities. The outreach program has involved presentations to the Tri-Cities Homebuilders Association, the City's Planning Commission, and the City's Utility Advisory Committee. In addition, a volunteer team was assembled to observe various street lighting systems in operation and provide qualitative input on their performance. The results of the volunteer evaluation are expected by September 19, 2014. Staff will present a summary of this public input at the workshop.

Staff intends to propose that updated standards be adopted that require use of LED lighting technology as indicated by the engineering analysis, pending supporting input from Council and the volunteer evaluation.


Attachments:

DKS - Richland Lighting Standards Review Final Report - Executive Summary

Post Council Status: Pending

City Manager Approved: Hopkins, Marcia
Sep 18, 14:54:48 GMT-0700 2014

City of Richland

# Lighting Standards Review

Prepared by

DKS

June 2014

# Table of Contents

## Table of Figures



## Table of Tables

## Useful Abbreviations and Acronyms

BUG – Backlight, Uplight, Glare

CALiPER – Commercially Available LED Product Evaluation and Reporting

Cd/$m^2$ – Candelas per square meter, a measure of luminance

CLO – Continuous Light Output

DOE – Department of Energy

Fc – Foot-Candle, a measure of illuminance

GHG – Greenhouse Gas

GPS – Global Positioning System

HID – High Intensity Discharge

HPS – High Pressure Sodium

IESNA – Illuminating Engineering Society of North America

Klm – kilolumen

LDD – Luminaire Dirt Depreciation

LED – Light Emitting Diode

LLD – Lamp Lumen Depreciation

LLF – Light Loss Factor

LM-79 – Electrical and Photometric Measurements of Solid-State Lighting Products

LM-80 – Measuring Lumen Maintenance of LED Light Sources

MH – Metal Halide

RP-8-00 – American National Standard Practice for Roadway Lighting

SCL – Seattle City Light

SDOT – Seattle Department of Transportation

SSL – Solid State Lighting

TIB – Transportation Improvement Board

TM-21 – Technical Memorandum 21, Projecting Long Term Lumen Maintenance of LED Light Sources

WSDOT – Washington State Department of Transportation

# Executive Summary

This report recommends changes to Richland's roadway lighting standards and provides steps to take to convert Richland's existing roadway lighting from High Intensity Discharge (HID), traditional street lighting that includes High Pressure Sodium (HPS) and Metal Halide (MH) lighting, to Light Emitting Diode (LED) luminaires. Included is a discussion of the benefits of LED roadway lighting, a discussion about trends in the LED lighting industry, analysis and recommendations for changes to design standards, anecdotes of the experience of other cities that recently converted to LED lighting, and recommended next steps for Richland to take.

## LED Benefits

Converting to LED street lighting has many advantages, including energy and maintenance savings, environmental benefits, and better light quality. The initial installation cost for LED lighting in new developments may be a little higher than traditional HPS lighting, due both to the higher cost of LED luminaires, and the spacing requirements of LED luminaires currently on the market. These costs can be offset by energy and maintenance savings.

As shown in Table A, Richland has a potential energy savings from between 38 and 59 percent by converting to LED lighting. The total energy saved is calculated based on the average operating wattages of three common, commercially available luminaires that meet the new light level guidelines recommended in this report.

**Table A: LED Energy Savings**

| Nominal HPS Replacement | | kWh Used per Year[1] per Luminaire | | | | kWh Saved per Year per Luminaire | | | Average Savings |
|---|---|---|---|---|---|---|---|---|---|
| | | HPS Nominal | LED Manufacturer #1 | LED Manufacturer #2 | LED Manufacturer #3 | LED Manufacturer #1 | LED Manufacturer #2 | LED Manufacturer #3 | |
| Local | 100W | 533 | 283 | 217 | 256 | 250 | 316 | 277 | 53% |
| Collector | 200W | 988 | 414 | 414 | 402 | 574 | 574 | 586 | 59% |
| Arterial | 200W | 988 | 566 | 689 | 570 | 422 | 299 | 418 | 38% |
| Arterial | 400W | 1919 | 1066 | 1033 | 1074 | 853 | 886 | 845 | 45% |

Table B provides maintenance costs over a typical 20-year life cycle for an HPS and LED luminaire. LED luminaires cost significantly less to maintain with no relamping requirements, and estimated one maintenance visit over their lifetime for cleaning and inspection, while HPS luminaires require up to four visits for cleaning and relamping. LED luminaires also have a much lower catastrophic failure rate than HPS luminaires. Since LED luminaires do not need to be relamped and have a much lower failure rate than HPS luminaires, cities that convert to LED lighting can reduce inventories of luminaires, so maintenance facilities that house inventory can be downsized or repurposed.

[1] Assumes 4100 hours/year operating time

**Table B: LED Maintenance Savings**

| | Typical HPS Cobrahead | Typical LED Cobrahead |
|---|---|---|
| Life Cycle (years) | 20 | 20 |
| Lamp Life (hours) | 24,000 | 100,000 |
| Lamp Life (years) | 5.9 | 24 |
| Scheduled Relamps/Cleaning Over Life of Fixture | 4 | 1 |
| Cost per Relamp/Cleaning (Maintenance + Parts) | $151.00 | $35.00 |
| Annualized Relamp/Cleaning Cost | $25.67 | $1.75 |
| Other Annualized Costs (Catastrophic Failure/Damage) | $3.55 | $0.21 |
| **Annual Maintenance Cost** | **$29.22** | **$1.96** |

In addition to cost savings, LED luminaires reduce greenhouse gas emissions through energy savings and fewer maintenance visits, reduce landfill waste due to the longer luminaire life with recyclable components, and do not contain hazardous materials such as mercury.

LEDs also produce more uniform light with individually aimed lamps. Traditional HPS luminaires have a single light source that is reflected and refracted into the desired distribution pattern, causing a loss of lumen output. LED luminaires also have better color rendering than the HPS luminaires they replace.

## Industry Trends

LED street lighting technology is rapidly evolving, and agencies all over North America are installing LED street lights. LED luminaires have been successfully implemented on residential streets, collectors, and arterials. The majority of installations are cobrahead style fixtures, but LEDs are also being used to replace High Intensity Discharge (HID) lamps in ornamental post-top fixtures, accent lighting, and pathway lighting.

The trends in the LED lighting industry show a reduction in luminaire cost as the technology continues to improve. In 2010, LED luminaires cost approximately $180 per kilolumen (klm), including both the first cost and operating and maintenance costs, and the cost is projected to decrease to just $13 per kilolumen by 2030. At the same time, luminaire efficacy (lumen output per watt) continues to increase. Average LED efficacy is expected to increase from 70 lumens per watt in 2010 to over 200 lumens per watt by 2030.

Since LED street lighting technology is still relatively new, luminaire life expectancy and maintenance requirements are estimated. Luminaire life expectancy is estimated at 20 years.

LED luminaires are expected to require less maintenance than HID luminaires. The estimated maintenance cycle will include only luminaire cleaning and inspection, and maintenance is estimated to occur once during the luminaire lifecycle, leading to savings from relamping and the number of regularly scheduled maintenance visits. Preliminary reports from cities that have converted to LED lighting show that LED luminaires experience fewer defects and outages compared with HID luminaires.

Control systems are available for LED lighting that can monitor the health of the luminaire, allow dimming control, and provide adaptive lighting that can be tailored to the time of day, traffic volumes, or pedestrian activity. Utilizing control systems can increase energy savings, prolong luminaire life, and reduce maintenance patrols.

## Lighting Standards Review

Richland's lighting standards were evaluated against current national and Washington State lighting guidelines. It is recommended that going forward, Richland adopt Illuminating Engineering Society of North America (IESNA) light level recommendations as this is the national recommended practice for roadway lighting.

**Recommendation:**
**Use luminance method and IESNA light level guidelines for roadway lighting.**

Typical HPS and LED luminaires (from three different manufacturers) were analyzed to create design recommendations for new street lighting installations. Table C, based on luminance calculation method, provides design recommendations developed to take into account site characteristics, luminaire characteristics, and pole characteristics. These guidelines are intended as a starting point for a lighting project, but since every project will have unique conditions and constraints, a lighting analysis is recommended to determine optimal pole placement and to ensure that recommended light levels can be achieved.

**Recommendation:**
**Adopt design recommendations provided in Table C. Determine appropriate light levels roadways based on pedestrian activity.**

Richland's current lighting standards are based on land use, and include light levels by functional classification for residential, intermediate, and commercial streets. It is recommended that Richland update its lighting standards to consider pedestrian activity, similar to IES and WSDOT lighting standards.

### Table C: Street Light Recommendations

| City of Richland Street Light Recommendations | | | Roadway Classification | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Principal Arterial Roadway | | | Minor Arterial Roadway | | | Collector Roadway | | | Local Street | | |
| Pedestrian Conflict Area | | | High | Medium | Low | High | Medium | Low | High | Medium | Low | High | Medium | Low |
| Average Maintained Luminance (cd/m$^2$) | | | 1.2 | 0.9 | 0.6 | 1.2 | 0.9 | 0.6 | 0.8 | 0.6 | 0.4 | 0.6 | 0.5 | 0.3 |
| Luminance Uniformity | | Ave/Min | 3.0 | 3.0 | 3.5 | 3.0 | 3.0 | 3.5 | 3.0 | 3.5 | 4.0 | 6.0 | 6.0 | 6.0 |
| | | Max/Min | 5.0 | 5.0 | 6.0 | 5.0 | 5.0 | 6.0 | 5.0 | 6.0 | 8.0 | 10.0 | 10.0 | 10.0 |
| Average Maintained Illuminance for curved roadway sections (fc)† | | | 1.7 | 1.3 | 0.9 | 1.7 | 1.3 | 0.9 | 1.2 | 0.9 | 0.6 | 0.9 | 0.7 | 0.4 |
| Illuminance Uniformity | | Ave/Min | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 6.0 | 6.0 | 6.0 |
| Site Characteristics | | Maximum Pole Spacing for HPS Lighting (ft) | 230 | 310 | 340 | 160 | 230 | 310 | 320 | 350 | 400 | 190 | 230 | 380 |
| | | Maximum Pole Spacing for LED Lighting (ft) ‡ | 180 | 220 | 280 | 150 | 200 | 300 | 220 | 280 | 340 | 210 | 260 | 350 |
| | | Setback (ft) | 8 | | | 8 | | | 8 or 2.5 | | | 8 or 2.5 | | |
| | | Configuration | Staggered* or Opposite | | | Staggered* or Opposite | | | Staggered* | | | Staggered* | | |
| Luminaire Characteristics | HPS | Luminaire Distribution | III | | | II | | | II | | | II | | |
| | | Fixture Wattage | 400 | | | 200 | | | 200 | | | 100 | | |
| | | Color Temperature | 2300 (±400) | | | 2300 (±400) | | | 2300 (±400) | | | 2300 (±400) | | |
| | | Minimum LLD (24,000 hrs) | 0.70 | | | 0.70 | | | 0.70 | | | 0.70 | | |
| | | Max BUG Rating | B4 U4 G5 | | | B3 U3 G3 | | | B3 U3 G3 | | | B2 U3 G2 | | |
| | LED | Luminaire Distribution | III | | | II | | | II | | | II | | |
| | | Max Fixture Wattage | 270 | | | 170 | | | 110 | | | 70 | | |
| | | Color Temperature | 4100K (±200) | | | 4100K (±200) | | | 4100K (±200) | | | 4100K (±200) | | |
| | | Minimum LLD (100,000 hrs) | 0.75 | | | 0.75 | | | 0.75 | | | 0.75 | | |
| | | Max BUG Rating | B3 U0 G3 | | | B2 U0 G3 | | | B2 U0 G3 | | | B1 U0 G2 | | |
| Pole Characteristics | | Mounting Height (ft) | 38 | | | 38 | | | 28 | | | 28 | | |
| | | Arm Length (ft) | 8 or 12 | | | 8 or 12 | | | 8 | | | 8 | | |

*Staggered spacing measured between luminaires on the *same* side of the road.

†For R2 and R3 Pavement

‡ Maximum spacing requirements may be revised periodically to better reflect the capabilities of new LED lighting technology.

The IESNA recommends using the illuminance method of analysis at intersections. The recommended illuminance level at an intersection is the sum of the recommended illuminance level on each of the intersecting streets. Table D provides IESNA light level values for intersections with different pedestrian and functional classifications.

**Recommendation: Use illuminance method and IESNA light level guidelines at intersections.**

**Table D: Intersection Light Level Recommendations**

| Functional Classification | Average Maintained Illuminance* by Pedestrian Activity | | | Uniformity Ratio |
|---|---|---|---|---|
| | High | Medium | Low | |
| Arterial/Arterial | 3.4 | 2.6 | 1.8 | 3:1 |
| Arterial/Collector | 2.9 | 2.2 | 1.5 | 3:1 |
| Arterial/Local | 2.6 | 2.0 | 1.3 | 3:1 |
| Collector/Collector | 2.4 | 1.8 | 1.2 | 4:1 |
| Collector/Local | 2.1 | 1.6 | 1.0 | 4:1 |
| Local/Local | 1.8 | 1.4 | 0.8 | 6:1 |

*For R2 and R3 pavement classifications

LED ornamental street lights can be viable solutions for roadway lighting. Lighting manufacturers sell a variety of traditional ornamental street lights as well as more modern fixtures that use LED technology. Pole spacing and mounting height are typically less than cobrahead style luminaires. A lighting analysis is recommended for all ornamental lighting projects unless a citywide ornamental light standard is developed and adopted.

**Recommendation: Adopt city-wide ornamental light standard, or require a lighting analysis for all projects using ornamental lighting.**

IESNA provides recommended guidelines for walkway and pathway lighting. These guidelines take into account the need for facial recognition between trail users. Multi-use paths are often lit with ornamental or shoebox style street lights mounted at lower heights, such as 16 or 20 feet.

**Recommendation: Use IESNA guidelines for multi-use path lighting.**

**Table E: Multi-Use Path Lighting Recommendations**

| Pedestrian Conflict Area/Land Use | Average Illuminance (fc) | Minimum Vertical Illuminance (fc) | Uniformity (Avg/Min) |
|---|---|---|---|
| High | 1.0 | 0.5 | 4 |
| Medium | 0.5 | 0.2 | 4 |
| Low/Medium Density Residential | 0.4 | 0.1 | 4 |
| Low/Low Density Residential | 0.3 | 0.08 | 6 |
| Low/Rural | 0.2 | 0.06 | 10 |

## Experience of Other Agencies

Three cities, Seattle, Kennewick, and Blaine, recently converted or are in the process of converting to LED or induction lighting. Staff from each of these cities contributed their experiences with their conversion process and provided recommendations for city-wide conversion projects and updating street lighting standards.

**Recommendations:**

- **Conduct a feasibility study.**
- **Have an accurate inventory of the existing system.**
- **Develop detailed specifications.**
- **Get samples of the luminaire before approval.**
- **Take advantage of incentive programs.**
- **Work with all parties involved from early on in the process, including the utility and other stakeholders.**

## Recommended Next Steps

There are several steps that are recommended for Richland to take with roadway lighting. In addition to adopting new lighting design guidelines as previously discussed, these steps include: require developers to install LEDs on new projects, develop a city-wide conversion program, and develop technical specifications for LED luminaires.

**Recommendations:**

- **Adopt design guidelines provided in this report.**
- **Adopt IESNA light level guidelines.**
- **Require developers to install LED street lights on new projects.**

### Private Development Design Requirements

Richland should consider requiring private developers to install LED rather than HID luminaires in new developments. The design guidelines provided in Table C can be used by private developers as a starting place to determine pole spacing, mounting heights, expected wattage, and other requirements. A lighting analysis is still recommended since individual site characteristics will vary.

**Recommendation:**

**Require developers to install LED street lights using the new street lighting design guidelines.**

### Conversion Project Implementation

A city-wide conversion project should be considered and can be completed in stages, or all at once depending on the available funding and City resources. Many cities that have converted to LED lighting have chosen to convert residential lighting first, followed by lighting on arterials streets and ornamental lighting. Low-wattage LED luminaires for residential applications are cost competitive with HPS luminaires. Higher wattage LED luminaires and ornamental luminaires are generally not as cost competitive as their lower wattage counterparts, but the technology and price is rapidly improving, so it may be advantageous to wait longer to install these fixtures.

## Technical Specification Development

Good technical specifications are critical for the success of implementing LED luminaires in new developments and for a city-wide conversion project. Two common approaches to developing specifications are application-based specifications (which define roadway and site characteristics, luminaire performance criteria, and luminaire physical characteristics) and evaluating and pre-approving manufacturers and/or individual luminaires. Regardless of the approach selected, the City should periodically re-evaluate the performance specifications and/or pre-approved luminaires as new luminaire models become available.

> **Recommendation:**
>
> **• Develop good application specifications or preapproved list.**
>
> **• Develop an evaluation program for new LED luminaires that come onto the market.**

It is important that LED luminaires perform as well or better than the HID luminaires they are intended to replace. The best way to accomplish this is to evaluate both the photometrics and physical characteristics of potential luminaires as they come on the market. It is recommended that Richland develop a program for evaluating new LED luminaires.

# Council Workshop Coversheet

Council Date: 09/23/2014

Agenda Item : W4

Key Element: Key 3 - Economic Vitality

Subject: JOINT PORT PROJECTS

Department: Community and Development Services

Document Type: General Business Item

Summary:


The City of Richland is served by two Port Districts. The Port of Kennewick (POK) serves a large area from Plymouth to West Richland, including the portion of Richland south of the Yakima River. The Port of Benton (POB) serves the rest of Benton County, including all of Richland north of the Yakima River. The City has worked well with both Port Districts, but as our goals change, it is important to redefine our partnerships with the Ports. Staff has been in recent discussions with each of the Ports about opportunities to maximize our collective efforts. With pending Council meetings with both Ports, tonight's workshop is an opportunity to discuss the City's ideas for useful partnerships.

POK – The majority of the POK jurisdiction within Richland is being successfully developed by the private sector. South Richland, City View, and Gage all continue to grow and maintain strong rents and valuations. Staff met with POK to discuss potential projects that would receive the greatest benefit from the combined efforts of the City of Richland and the POK. The Port has agreed to help with expansion of parking at Trailhead Park, but City and port staffs agree the greatest challenge and greatest long-term benefit will come from a focus on the Island View area. This part of Richland remains underdeveloped due to a poor mix of uses, challenging lot sizes, and inefficient infrastructure, yet this area along with Columbia Park West represents some of the best riverfront development potential in Richland. Staff believes that coordinated efforts between COR and POK is the best strategy to affect change. Staff recommends a partnership with the POK to develop a long range (20 years) strategy for the redevelopment of this area and establishing a development authority to be responsible for managing the implementation of the plan. This represents a long term commitment between the two agencies to help improve the tax base and improve land values within our shared jurisdiction.

POB – Richland and POB have enjoyed a successful partnership in the development and growth of the Tri-Cities Research District and Horn Rapids. The two agencies continue to work together to recruit new businesses and developers to Richland. As the City focuses more on the Riverfront District, there may be new partnership opportunities with the Port. This might take any of several forms:

- Investment in tourism infrastructure in the Riverfront District;
- Improvements to the Columbia Point Marina and other maritime activities;
- Partnerships to develop Columbia Point South and/or the City's property south of the Shilo Inn;
- Improvements to wayfinding, streetscapes and trail linkages between the Research and Riverfront Districts of the City; and/or
- The Port assuming a larger role in marketing and developing the Horn Rapids Industrial Park so the City can focus on the Riverfront District.

The specifics of our partnership with the Port are still under discussion and may be influenced by the reorganization of the City's Community Development department.


Attachments:

Post Council Status: Pending

City Manager Approved: Hopkins, Marcia
Sep 18, 14:54:57 GMT-0700 2014

# Council Workshop Coversheet

Council Date: 09/23/2014

Agenda Item : W5

Key Element: Key 5 - Natural Resources Management

Subject: PROPOSED HILLSIDE DEVELOPMENT REGULATIONS

Department: Community and Development Services

Document Type: Discussion

Summary:


On October 30, 2012, Council held a joint workshop with the Planning Commission to discuss hillside development regulations. At that time, the Commission had worked with staff to prepare an early draft of a set of regulations that was intended to lessen the impact of development on steep slopes. Since then work on these standards has progressed slowly. In part, this is because other work priorities have limited the time available for this project and in part because staff has struggled with finding the right balance between regulations that adequately protects public safety and the aesthetics of the City's most visible hillsides and respecting the private property rights of landowners. The purpose of this workshop is to bring Council up to date on the progress made on this issue and determine our readiness to move these proposed regulations into broader public review.

Following the 2012 workshop, staff was invited to a Home Builders Association meeting to discuss the draft regulations. They voiced objections and questioned the constitutionality of the proposed regulations. Following this meeting, staff reasoned that the draft ordinance should be reviewed by a land use attorney to ensure that adoption of these regulations would not exceed the City's authority. In fact, the attorney's review of the draft regulations raised significant issues. Many of the standards included in the original draft were vague and needed to be better defined. After additional consideration and further research into standards adopted by other communities and work sessions with the Planning Commission, staff is now suggesting that a much simplified version of the hillside regulations be pursued.

The current draft is focused on two primary objectives:  The first is the preservation of the natural ridge line. New homes constructed on the hillside would have to be built far enough below the ridge line so as not break the silhouette as view from a distance. The second objective is to limit the height of retaining walls. Walls over 3 feet in height would need to benched and landscaped. Other provisions establish standards for future commercial development. The Badger Mountain Subarea plan calls for a neighborhood commercial center located at the intersection of the future Queensgate extension and the future road that is planned to extend northward from the Badger Mountain South community. Other features of the regulation include a relaxation of setback standards for homes built into the hillside to potentially reduce the amount of cutting and filling needed to create building pads on hillside lots.

The most recent draft of the proposed hillside regulations is attached for your review.


Attachments:

1) Draft Hillside Standards

Post Council Status: Pending

City Manager Approved: Hopkins, Marcia<br>Sep 18, 14:55:07 GMT-0700 2014

**Chapter 23.36**
**HILLSIDE AND RIDGELINE OVERLAY DISTRICT**
***August 2014***

Sections:



**23.36.010 Purpose.**

The provisions of this chapter are intended to:

A. Preserve the city's environmental and scenic resources by encouraging the retention of natural topographic features and vegetation;

B. Recognize that as the slope of a development site increases so does the potential for environmental degradation and liability related to slope failure, and increased storm water runoff that will also increase the potential for erosion;

C. Encourage grading practices that are appropriate in hillside areas; and

D. Implement the urban design goals contained in the City's Comprehensive Plan, relating to the protection and preservation of natural features such as ridgelines and steep slopes.

**23.36.020 Applicability.**

The requirements and guidelines in this chapter apply to subdivisions, and all other proposed development that falls within a designated Hillside Development Overlay District. The provisions of the Hillside Development Overlay District shall apply to all properties within the City of Richland that are located south of the Yakima River and that contain steep slopes. Lands with steep slopes are defined as all lands having a naturally formed slope of 15 percent or greater, based on five foot contour intervals, with a minimum elevation differential of 25 feet. Applicants for land development approvals shall submit contour mapping sufficient to demonstrate their inclusion or exclusion into the Hillside Development Overlay District to the satisfaction of the Administrator.

**23.36.030 Setback standards.**

Any residential structure shall comply with the following setback requirements, which supercede the requirements of the base zoning district, to locate buildings as close as possible to the streets, encourage compact development, thereby minimizing the disruption of natural features.

**Hillside Setbacks**

| Property Setback | Setback Distance |
|---|---|
| Front | 15 ft. for main structure; 18 feet for garage or 10 feet for side-load garage |
| Side | 10 ft. [1] |
| Rear | 15 ft.[1] |
| Ridgeline | 50 vertical feet from ridgeline. Refer to Section 23.36.040 |

[1] Earth sheltered homes whose rear walls are completely built into the hillside and do not extend above the natural grade of the slope may be built to within 5 feet of a rear or side property line.

Whenever there is a conflict between the setback standards listed herein and specific setback requirements mandated in a geotechnical report or setbacks from slopes as required under the provisions of the International Building Code or the International Residential Code, the greater setback standards shall apply.

**023.36.040 Ridgeline standards.**

A. A new structure or addition is prohibited within fifty vertical feet of a ridgeline. The fifty vertical foot measurement is to be taken from the point on the ridgeline that is closest to the proposed building site and the finished grade plane as defined in RMC 23.06.405. For the purposes of this chapter, a ridgeline is defined as a line marking or following the highest elevation of a ridge that lies above an elevation of 1,000 feet above sea level.

**23.06.405 Grade plane.** "Grade plane" means a reference plane representing the average of finished ground level adjoining the building at exterior walls. Where the finished ground level slopes away from the exterior walls, the reference plane shall be established by the lowest points within the area between the building and the lot line or, where the lot line is more than six feet from the building, between the building and a point six feet from the building. [Ord. 28-05 § 1.02].

B. An exception to the standard identified in 23.36.040A may be granted if the review authority first finds that:

i. There are no feasible building sites on the parcel that avoid ridgeline development, due to the physical limitations of the site including but not limited to extreme or unstable slopes; and

ii. The proposed building site is located to minimize visual impacts to the ridgeline to the greatest degree practical; and

ii. The development will avoid significant adverse visual impacts due to the structural design of the proposed building, including height, bulk, size, foundation, siting, and landscaping.

C. Where a legal lot existing prior to the effective date of the ordinance codified in this section contains no feasible building site other than where a structure will extend above the ridgeline, proposed structures shall not exceed a height of sixteen feet above the highest point on the ridgeline or hilltop within one hundred feet of the proposed structure. See Figure 5-9.

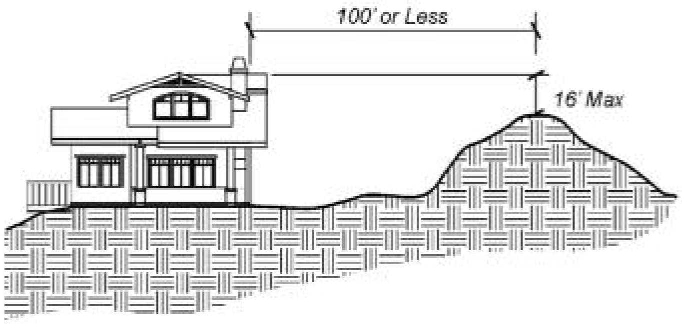



**Figure 5-9. Highest Point Within One Hundred Feet of Structure**

**023.36.050 Retaining Walls**

Any embankment to be retained that is over forty-eight inches in height shall be benched so that no individual retaining wall is exposed more than thirty-six inches, and each bench is a minimum width of thirty-six inches. See Figure 5-13.

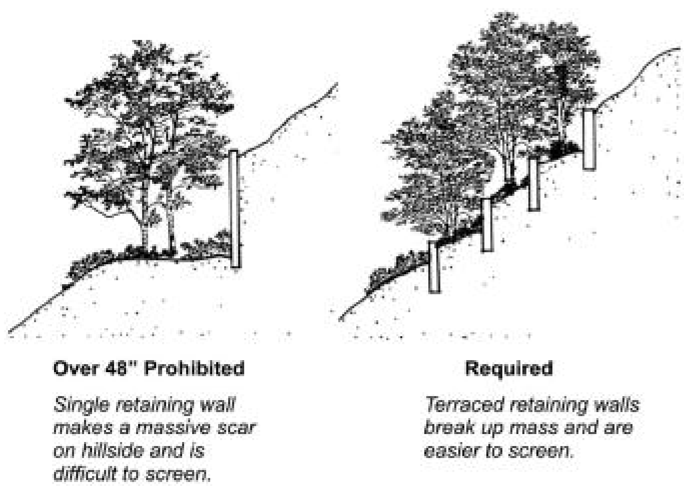



**Figure 5-13. Retaining Wall Design**

**23.36.060 Commercial Standards**.

Any structure proposed within the Hillside and Ridgeline Overlay District that is not a single family residence, or a structure that is accessory to a single family residence, shall be considered a commercial structure and is subject to conformance with these standards:

A.  Retaining Structures. Retaining walls or structures shall not be more than 48 inches in height. Any embankment over 48 inches in height shall be benched so that no individual retaining structure is higher than 48 inches and each bench between retaining structures shall be a minimum width of 36 inches. Each bench area shall be landscaped to screen the view of the retaining structure.

B.  Retention of Steep Slopes. Slopes that are over 25% in grade shall be left in a natural state to the greatest extent feasible.

C.  Building Design Guidelines. Commercial buildings shall be designed to minimize the apparent size of exterior walls. Building design should make use of varying setbacks and roof pitches, low retaining walls and landscaping to blend the structures into the terrain and break up massive forms. No part of a proposed structure shall appear silhouetted against the sky above the nearest ridgeline when viewed from the nearest collector or arterial street, as designated in the City's transportation plan

D. Parking Lots. Parking areas shall be sized in accordance with parking standards for size and number of parking spaces as set forth in Chapter 23.54 RMC. The number of parking spaces provided for any commercial use shall not exceed 125% of the minimum parking standard as identified in Section 23.54.020 RMC. Screening of parking areas within the Hillside and Ridgeline Combining District shall be required to screen or reduce the visibility of the parking areas when viewed from a public street. (Interior landscaping requirements set forth in Section 23.54.110(B) RMC may be waived by the review authority.

E. Signing and Lighting Standards. Signing requirements within the Hillside and Ridgeline Combining District shall be consistent with the standards set forth in Title 27 of the RMC for C-1 Neighborhood Commercial uses in terms of the number and size of permitted signs. Outdoor lighting shall be shielded to avoid glare and the spill of light to surrounding areas. Low-level lighting and low-profile fixtures are encouraged.