



KERR WOOD LEIDAL
consulting engineers

Section 2

Land-Use



2. Land-Use

When combined with the design criteria, the land-use is the basis for generating and distributing the flows to the wastewater system. This section outlines the existing and future land-uses.

2.1 Existing Land-Use

The existing population densities for parcels currently connected to the sanitary sewer system are illustrated on Figure 2-1. Each of the land-uses are described below.

2.1.1 Residential Land-Use

The residential land-use represents single family detached dwellings as well as multi-family attached dwellings (duplex, townhouse, condominiums). The existing (2011) total residential population of 16,093 was obtained from Statistics Canada. This population was distributed to the active residential parcels based on census block data and confirmed using the existing zoning and visual assay of developed lots in orthophotos.

2.1.2 Industrial, Commercial and Institutional (ICI) Land-Use

The sanitary sewer flows from the ICI areas are modelled by assigning a population equivalent on a per hectare basis. For the City the ICI land-uses contribute only a minor portion of the flow. The ICI land-uses are described below.

Industrial

The Industrial land-use density used for modelling purposes was developed based on published information and standard values used by KWL on similar modelling assignments. The value used for the existing scenario is 25 PE per ha, which would represent standard light industrial (manufacturing/warehouse) type uses that generate relatively low amounts of wastewater.

Commercial

The Commercial land-uses are primarily located along Sooke Road and can generally be described as restaurants and retail with some office. The value used for the existing scenario is 60 PE per ha, which is based on published information and standard values used by KWL on similar modelling assignments.

Institutional

The existing major Institutional properties (excluding Royal Roads which is described separately below) and their student populations are provided in the following table.



Table 2-1: School Populations

School	Grades	Student Population
Dunsmuir Middle	7 to 9	616
Ecolé John Stubbs Memorial ¹	K to 9	725
Colwood Elementary ¹	K to 6	183
Wishart Elementary	K to 6	315
Sangster Elementary	K to 6	167
David Cameron	K to 6	313

Note: 1 – currently connected to the municipal sewer system

For Colwood Elementary the student population was converted to a population equivalent based on previous work by KWL. This previous work has found that 1 student equates to approximately 0.1 PE. For Ecolé John Stubbs Memorial, the flow rate was assigned based on flow measurement data.

For the minor institutional properties such as learning centres, pre-schools and daycares, the value used for the existing scenario is 50 PE per ha.

2.1.3 Major Properties

Olympic View

The Olympic View property is currently an 18 hole golf course, club house, restaurant and banquet room. This property is located in the City of Colwood, City of Langford and District of Metchosin. Currently this property does not have a connection to any municipal sanitary sewer systems and wastewater is treated and disposed of on-site.

Royal Bay

For the purposes of this study, Royal Bay is defined as the undeveloped portion of the former Lehigh Gravel Pit. This property is not currently connected to the sanitary sewer system.

Royal Roads University

Royal Roads University has a long-term lease from the federal government for the use of the grounds and facilities.

University facilities staff stated that students spend the majority of their time off campus. As a result the number of enrolled students is significantly higher than the number of students on campus at any one time. The statistics received from the University are for the average number of students on campus in one day: The existing student and staff populations are summarized as follows:

- 330 average daily students on campus; and
- 360 staff members.

Based on a review of the flow monitoring data obtained from the CRD, Royal Roads has a population equivalent of approximately 140.

There are 14 DND family houses located between the University and Sooke Road. These houses contribute to the Colwood system separately from the University. For these 14 properties a population of 24 has been assigned based on the census population distribution exercise.



DND Belmont

The total number of residential housing units for DND Belmont is 473. The total number of residents within this area is estimated to be 1,281, based on the 2011 Census data.

Royal Colwood Golf Course

The Royal Colwood Golf Course is an 18-hole golf course, club house, restaurant and banquet room. This property is located in the City of Colwood, however the connection to the CRD trunk sewer is upstream of the Meaford (Langford) Flow Monitoring Weir. Based on these facilities, and previous work completed by KWL, a population equivalent of 60 has been assigned for this property.

Colwood Corners

Currently the Colwood Corners area includes residential and commercial land-uses. The existing residential population has been assigned based on the census data and commercial population equivalents are calculated based on 60 PE per ha. It is estimated that the Colwood Corners properties will undergo significant redevelopment and densification. The future land-uses and densification of this area is discussed in the Future Land-Use section below.

DND Colwood

The DND Colwood property has a wide variety of uses. Through discussions with DND staff we understand these include facilities such as the Fleet Diving Unit, the Canadian Pacific Activity Centre, firefighter training facilities, warehouses, and educational buildings. DND staff indicated that they expect there are currently less than 200 people on-site on a daily basis.

Based on a review of the flow monitoring data obtained from the CRD, DND Colwood has a population equivalent of 437.

Additionally, while receiving fuel at a DND Colwood jetty, some of the naval vessels will pump ballast water into the sanitary sewer system. It is understood that this pumping into the sanitary sewer system is coordinated with the City's public works to ensure the system is not overwhelmed. We have therefore not included this ballast water pumping in the sanitary sewer model as it is assumed to occur very infrequently and during off peak periods.

Juan de Fuca Recreation Centre

The Juan de Fuca Recreation Centre includes the following wastewater generating facilities:

- 2,300 seat Bear Mountain Arena;
- 950 seat Juan de Fuca Arena;
- Library;
- Administrative building;
- 25 m swimming pool;
- 9 hole golf course with adjacent club house/field house;
- 3,500 ft² weight room;
- 8 sheet curling rink and lounge area, and;
- Various meeting rooms.

Based on a review of the flow monitoring data obtained from the CRD, the Juan de Fuca Recreation Centre has a population equivalent of 132.



2.2 Future Land-Use

Future land-use was developed in order to populate the future modelling scenario. The results from the future modelling scenario are the basis for sizing future infrastructure as well as indicating possible capacity limitations in the existing infrastructure (the City's and the CRD's).

In developing the future land-use scenario a series of meetings were held with the City's Engineering and Planning departments and projections of future land-uses and densities were assigned. As sanitary sewer infrastructure can have a life span of 50 to 100 years or longer, the land-use projections were made considering time frames in this range. It should be noted that the future land-uses are a long term estimate only and do not represent a commitment or acceptance of these land-uses in the future.

The future land-use plan developed through working with the City's Engineering and Planning departments is shown on Figure 2-2. The individual land-uses are described below.

The future land-use densities, as used in the future modelling scenario, are illustrated on Figure 2-3.

2.2.1 Residential Land-Use

The residential land-use represents single family detached dwellings as well as multi-family attached dwellings (duplex, townhouse, condominiums). The residential population, calculated based on the future land-use plan, results in a population of 46,697. This represents a 190% growth above the existing (2011) residential population of 16,093.

The various residential land-uses are described below.

Existing Residential

The existing residential areas are estimated to undergo little or an insignificant change from the current populations. In populating these areas for the future scenario, the existing populations were used.

Existing Residential plus Infill

The existing residential plus infill areas are estimated to grow by 5%, 10% or 20%, as shown on Figure 2-2. The future populations for these areas were derived by taking the existing populations and increasing them by the percentages as indicated.

Residential Development Properties

The residential development properties indicated are expected to be developed as either single family units, multi-family units or a combination of single family and multi-family. For development densities less than 15 units per hectare (single family developments) we used population densities of 2.7 people per unit (same as the existing density for single-family residential). For development densities of 15 to 24 units per hectare (low to moderately dense multi-family developments) we have used population densities of 2.5 people per unit. For development densities greater than 24 units per hectare (high density multi-family developments) we have used population densities of 2.2 people per unit.

These population densities (people per unit) were derived through analysis of the 2011 Census data and comparing with the existing number of units for single family and multi-family land-uses.



2.2.2 Industrial, Commercial and Institutional Land-use

The sanitary sewer flows from the ICI areas are modelled by assigning a population equivalent on a per hectare basis. For the City the total future ICI contributes only a minor portion of the flow as the PE is only 7,614, or only 14% of the total PE when including residential. The ICI land-uses are described below.

Industrial

The Industrial land-use density used for modelling purposes was set to match the existing density of 25 PE per ha, which would represent standard light industrial (manufacturing/warehouse) type uses.

Commercial

It is anticipated that existing commercial areas will generally undergo development and densification and the PE density is expected to increase. The value used for the future scenario is 90 PE per ha, or 50% higher than the PE density in the existing scenario.

Institutional

For the institutional properties (excluding Royal Roads which is described separately below) a density of 50 PE per hectare (excluding playground areas) has been used. A potential new school in the Royal Bay Drive / Promenade Crescent area is included in the future scenario. This equates to a future total institutional PE of 2,077.

2.2.3 Major Properties

Olympic View

The Colwood portion of the Olympic View property has been estimated to have land-uses for the future scenario as follows:

- 201 single family dwelling units;
- 140 low density multi-family units;
- 115 urban centre multi-family dwelling units;
- 120 suite hotel; and
- 1,250 m² of retail commercial with a model loading rate of 90 PE per ha.

We received a copy of a Memorandum of Understanding² which discusses the Langford portion of the Olympic View Golf Course connecting to the Colwood sanitary sewer system. We also received a plan prepared by Bullock Baur and Associates illustrating future sanitary sewer routes for the Olympic View site. This plan shows the Langford portion of Olympic View contributing to the Colwood sewer system. As a result we have assumed that the Langford portion of Olympic View will also contribute to the Colwood system. The resulting total (Colwood and Langford) future land-uses used in the model are as follows:

- 325 single family dwelling units (2.7 people per unit);

² Memorandum of Understanding, Services for Olympic View Development, July 21, 1997, between City of Colwood and District of Langford, and Happy Valley Timber Ltd., and Olympic View Golf Course Ltd.



- 347 low density multi-family units (2.5 people per unit);
- 245 high density multi-family dwelling units (2.2 people per unit);
- 135 hotel suites with a model loading rate of 1.5 PE per suite; and
- 3,500 m² of retail commercial or a gross area of 0.7 ha with a model loading rate of 90 PE per ha.

The Bullock Baur plan shows a portion of the Olympic View site serviced by the sanitary sewer on Briarwood Lane, with the balance contributing to the sewer on Latoria Road. We have estimated that to the Briarwood Lane there will be 148 single family units and approximately one third of the low density multi-family units (115 units).

We also received a copy of the technical memorandum, Latoria Valley Downstream Sewer capacity Review³. This memorandum states that a population equivalent of 650 could flow by gravity into Langford and that Westshore Environmental (the operators of the Langford sewer system) felt that they could accept the gravity flow from Olympic View. However, for our analysis we have assumed all of the Langford portion of Olympic View flows to the Colwood system.

Royal Bay

The Royal Bay property has been estimated to have land-uses as follows for the future scenario:

- 1,800 single family dwelling units (2.7 people per unit); and
- 1,400 multi-family dwelling units (2.2 people per unit, assuming high density).

These values are in addition to those areas already developed (i.e. Promenade Crescent and Pelican Drive areas). The Royal Bay development is planned for a mix of land-uses including residential, commercial and institutional. It was stated during our future land-use planning meetings that the 3,200 residential units would adequately account for the other land-uses within the Royal Bay development also.

Royal Roads University

Royal Roads University has estimated that their future average daily student on campus and staff populations will be as follows:

- 1,400 average daily students on campus; and
- 500 staff members.

Using the same population equivalent to staff and student ratio as the existing scenario, the total future population equivalent used for Royal Roads is 392.

We have assumed that there will not be any expansion of the 14 DND family houses located between the University and Sooke Road.

DND Belmont

Through our discussions with DND staff, we understand that the population of DND Belmont is not expected to grow more than 10% in the foreseeable future. We have assumed a 10% growth for a future residential population of approximately 1,400.

³ Technical Memorandum, Latoria Valley Downstream Sewer Capacity Review, March 12, 2007, Bullock Baur Associates Ltd.



Royal Colwood Golf Course

We are not aware of any significant changes to the Royal Colwood Golf Course and have therefore maintained the existing population equivalent for this property.

Colwood Corners

It is estimated that the Colwood Corners properties will undergo significant redevelopment and densification. The estimated densities are as follows:

- Office and retail commercial with a model loading rate of 90 PE per ha over 50% of the Colwood Corners area; and
- 4,890 multi-family dwelling units which represents a density of 100 units per hectare over the entire Colwood Corners area.

The resulting total future PE for Colwood Corners is 11,900.

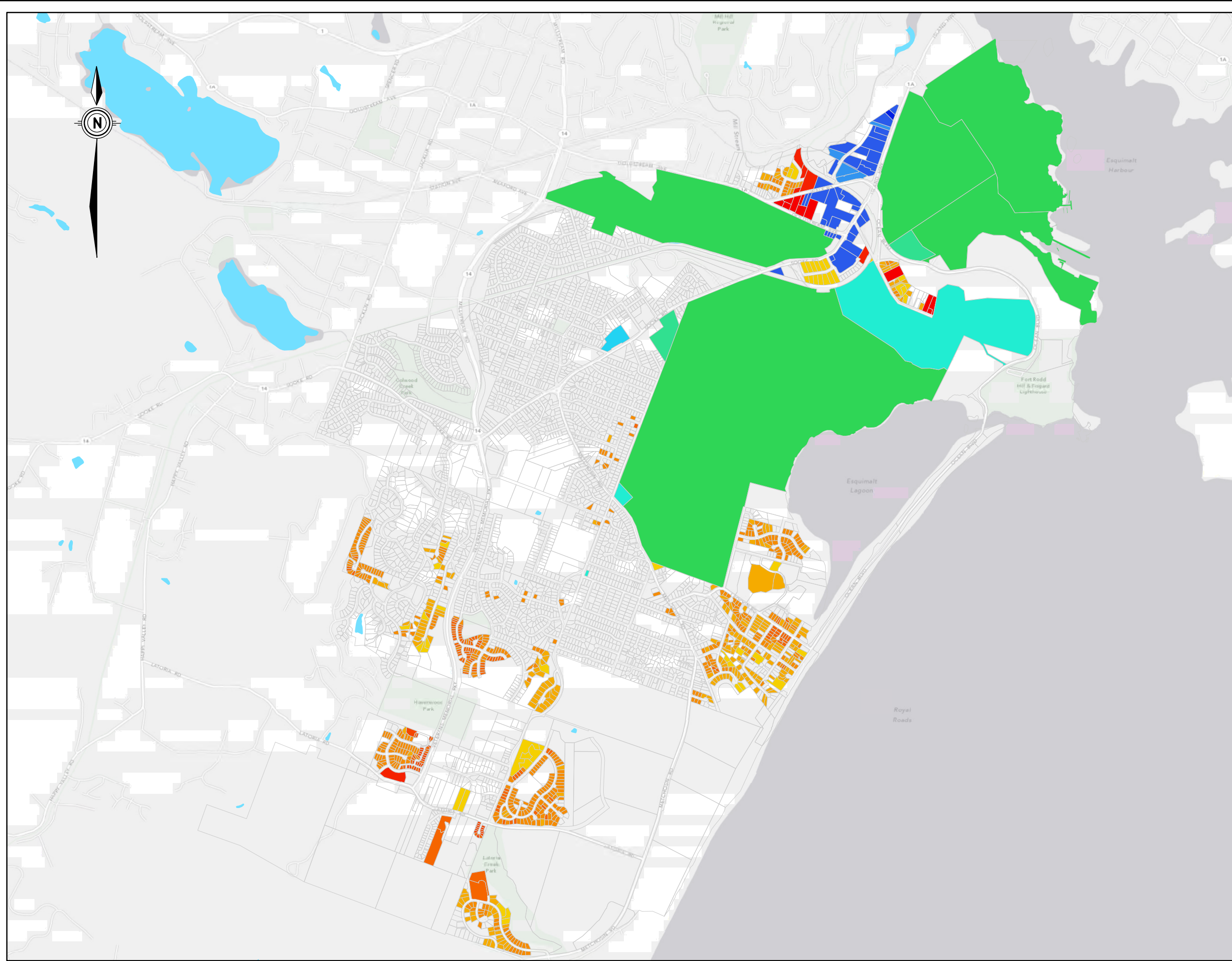
DND Colwood

DND staff were not able to discuss future plans for the DND Colwood site. It was hinted at that significant growth was not planned for this site. We have therefore assumed a 10% growth for a new population equivalent of 480.

Juan de Fuca Recreation Centre

Through discussions with Juan de Fuca Recreation staff we understand that a long term plan does not exist. They also mentioned that their future growth plans are increasingly more uncertain as a result of the City of Langford recently constructing their own recreation facilities.

However, after discussing with Colwood staff we decided it is prudent to assume that the Juan de Fuca Recreation Centre would grow at the same rate as the overall Western Communities. As summarized above, the residential population of Colwood in the future scenario represents a growth of 190%. KWL has previously estimated the future populations for the City of Langford. This analysis indicated a 2045 population of 60,852. This equates to a growth of 144%. Summing the current and future population for Colwood and Langford, the total growth is 160%. This same growth rate has been applied to the population equivalents for the Juan de Fuca Recreation Centre for a new total of 343 PE.



City of Colwood Sanitary Sewer Master Plan

Legend

2011 ICI/Mixed (PE/ha)

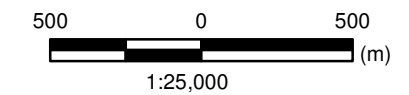
- 0
- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 65
- 65 - 85

2011 Res (PE/ha)

- 0
- 0 - 15
- 15 - 30
- 30 - 50
- 50 - 75
- 75 - 100
- 100 - 150
- 150 - 200



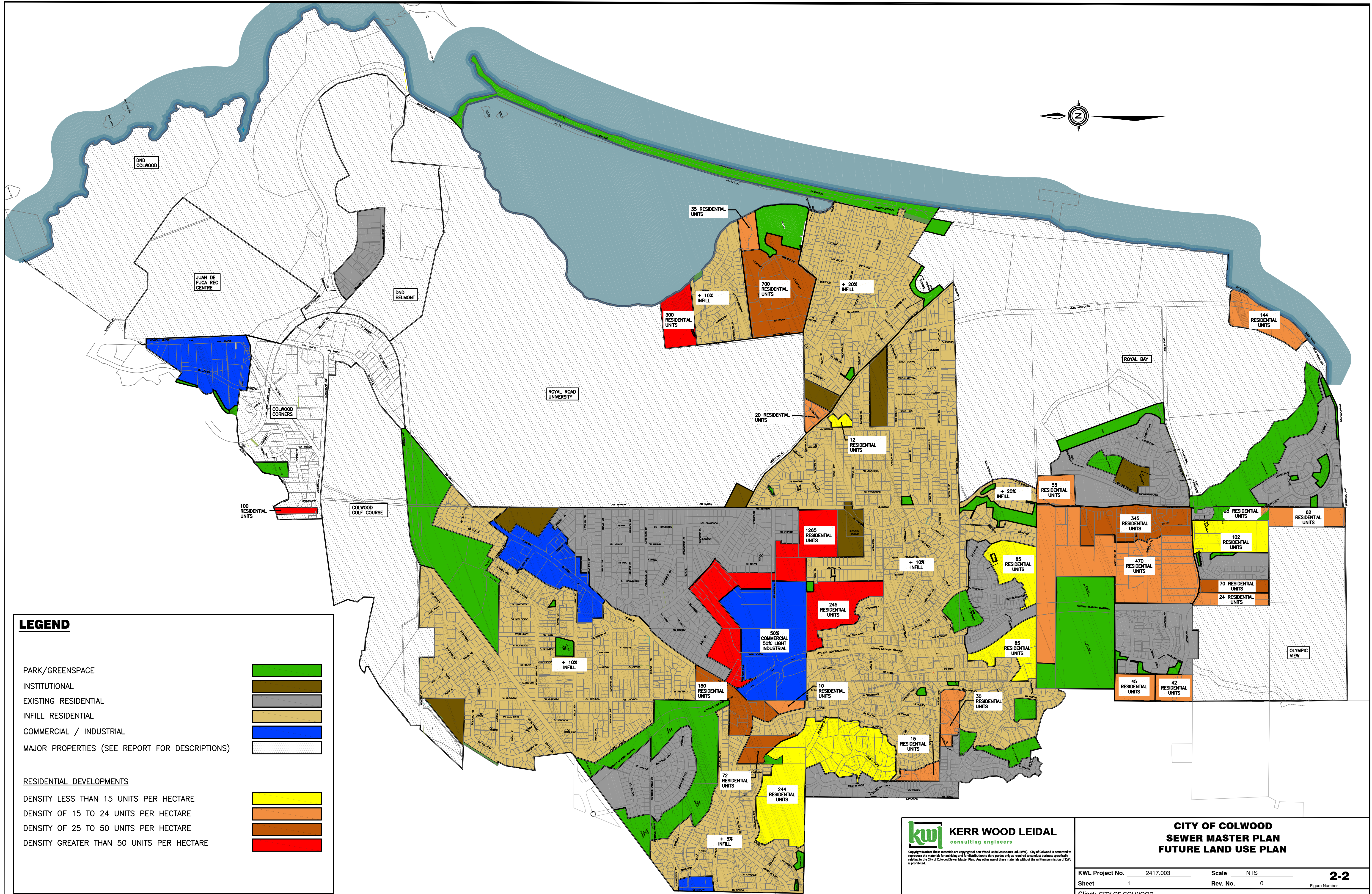
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Project No. 2417-003	Date June 2012
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Existing Population Density Connected to Sewer System

Figure 2-1

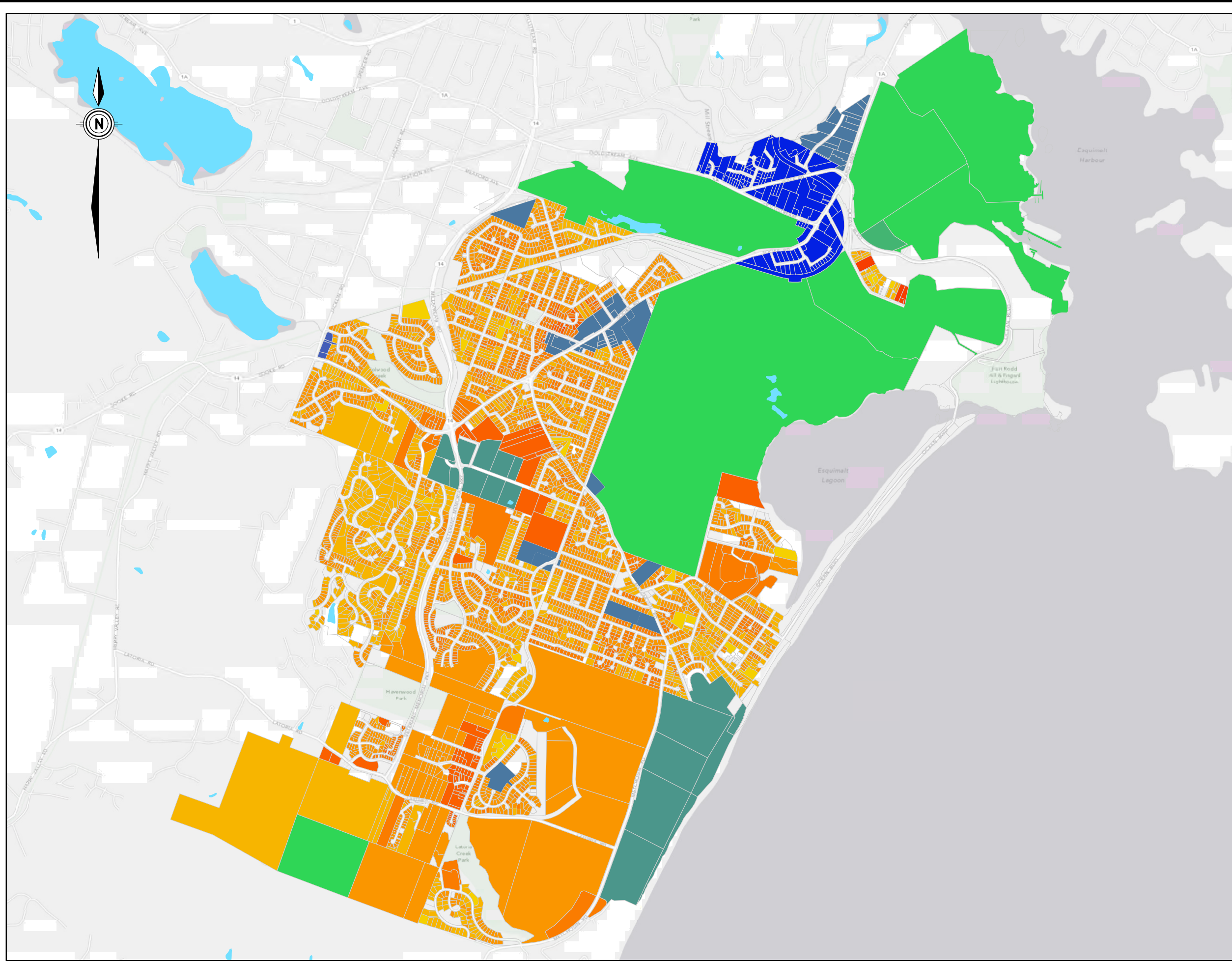


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 consulting engineers

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**CITY OF COLWOOD
 SEWER MASTER PLAN
 FUTURE LAND USE PLAN**

KWL Project No. 2417.003	Scale NTS	2-2
Sheet 1	Rev. No. 0	Figure Number
Client: CITY OF COLWOOD		



City of Colwood Sanitary Sewer Master Plan

Legend

Future ICI/Mixed (PE/ha)

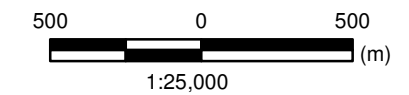
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- 0 - 10
- 10 - 30
- 30 - 60
- 60 - 95
- 95 - 175
- 175 - 250
- 250 - 330

Future Res (PE/ha)

- 0
- 0 - 10
- 10 - 30
- 30 - 50
- 50 - 90
- 90 - 150
- 150 - 300
- 300 - 500



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Future Population Density

Figure 2-3