BC HYDRO AND POWER AUTHORITY

INVENTORY OF UNDEVELOPED OPPORTUNITIES AT POTENTIAL MICRO HYDRO SITES IN BRITISH COLUMBIA

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CONTENTS

List of Tables and Figures

Appendices

DISCLAIMER

This report has been written for BC Hydro for the purpose of documenting potential hydro power sites in British Columbia. Any reliance on the information contained herein is at the risk of the user. Anyone considering a micro hydro development is urged to make independent inquiry of the site, hydrology and regulatory conditions affecting such a development before proceeding. BC Hydro will not be responsible for any costs by any person howsoever incurred in the potential development of a micro hydro project or in an attempt by such person to obtain rights, contracts or other requirements necessary for a development. The mention in the report of any site, technique, product, or company is for information purposes only and shall not be considered an endorsement by BC Hydro.

1. INTRODUCTION

This inventory has been prepared under the sponsorship of the BC Hydro Energy Futures Program. BC Hydro intends to acquire a portion of the 10% target of its new energy requirements from renewable resources under this Program and this inventory of small undeveloped hydro power sites represents one component of the overall resource. In addition to this inventory, there is a Handbook of Micro Hydro Development that explains requirements in the development process.

Since electricity markets and BC Hydro policies are subject to change over time, prospective developers are urged to refer to the website at www.bchydro.com.

2. SCOPE

This inventory is aimed at the undeveloped small hydro sites in British Columbia that are from 0.1 – 2 MW and that are deemed to be within an economic connection and transmission cost from the existing electrical system. An analysis of the next size of projects from 2-5 MW is also described as indicated in Section 3 because of the relative imprecision in selecting a group of projects that is strictly under 2 MW.

Small and micro hydro technologies are often considered to be "green energy" because there are no air emissions associated with the output of the electricity. This determination, however, is site specific, since projects can be and have been constructed that are not green based on the criteria noted in Appendix 1. The determination of green within the context of micro hydro is primarily based on the need to preserve water flows for fish and the absence of a significant reservoir. There is also a discussion of the practical methods of assessing the "greenness" of a project in the Handbook noted above.

Part of this report deals with the relative economics of micro hydro generation. It will be seen that smaller scale projects have generally higher costs based on their lower economies of scale. This is based on the equipment and labour costs generally costing more per unit of electrical output for smaller projects as well as for relatively fixed items such as design and permitting which may cost as much for a smaller project as for a larger project. One of the objectives of the Energy Futures Program is to try to address, through innovation and other means, ways of lowering the development costs and making it possible for more of these projects to be developed.

3. BACKGROUND

This inventory of undeveloped micro hydro sites in British Columbia is based on the inventory that was part of the publication **Small Hydro Technology and Resource Assessment,** which was produced for the BC Ministry of Energy in 1983. Other inventories have also been produced at various times, notably by provincial agencies such as the Water Rights Branch, the BC Power Commission and BC Hydro. Each of these inventories has had a specific purpose but the Small Hydro Technology and Resource Assessment comes closest to the needs of the present work. When the Assessment was

done, it was targeting projects of less than 20 MW that were within an economic distance of the provincial electrical grid that encompassed mainly the power lines of BC Hydro and West Kootenay Power. For the purpose of this inventory a subset of the Assessment has been targeted, namely the projects that are from 0.1-2 MW and those that are in the 2-5 MW range.

The 1983 inventory was developed from map and regional hydrology studies. Typically 1:50,000 or 1:100,000 scale maps were reviewed to find stream basins that seemed to have development potential. Areas that were reasonably close to transmission or distribution lines were reviewed, as well as areas that were near to remote diesel stations. Stream basin areas were determined and the steepest section of creek that was over 10% slope (in grid areas) and over 5% slope (in diesel areas) was selected as the best location for an intake, penstock and powerhouse. The projects are assumed to be run-of-river (no headpond or water storage). The information on flows, penstock length, head, transmission distance and road access distance was used to estimate the principal costs of the development.

The determination of the power P available in kilowatts is a function of the design flow and the available gross head at an assumed 80% efficiency which includes headloss, as shown in the following equations:

- $P = Q\ H \times 7.83$ where Q and H are in m^3/s and metres respectively or
- $P = Q\ H \times 0.0676$ where Q and H are in cubic feet per second and feet respectively

The design flow is related to regional runoff patterns and is set as the mean annual flow, which provides a reasonable estimate of an economic plant size. In the 1983 inventory the design flow was set at the mean annual flow based on references available at the time and some simple calculations to find the least costly cost per kWh. The choice of mean annual flow is only an indicator, because other considerations apply, including:

- a relatively high electricity value, which will encourage a larger project and higher design flow;
- peaky runoff in a run of river situation, which will result in smaller design flows being optimal;
- amount and timing of fish flow releases;
- site specific considerations, such as project layout; penstock and turbine availability; storage or flow regulation; values of electricity by time of day and seasonally; and operational and lending costs.

In a complete analysis the preceding parameters and resulting costs and benefits will all combine to derive an optimal project size that may be higher or lower than the size based on the mean annual flow.

In order to provide a flow estimate for each site, a large number of streams were selected that had long term flow records. From these stream flows, average runoffs on a unit area basis for given regions were determined and used as representative of the mean unit flow at each site. Thus the design flow at a given site is based on the mean unit flow times the basin area. The investigation to determine head was hampered by the fact that the

contours were usually of 100 ft (30m) intervals which does not permit accurate estimates of the available head if the actual head over the steep section of creek was more or less than a multiple of 100 ft. In addition, sometimes the location of the contour on the map (especially on lower head sites) may be in error, resulting in an incorrect estimate of the length of penstock. Waterfalls are often shown on the maps but the head at the falls is often not indicated. These are shown as potential sites because the presence of a waterfall would usually provide a head drop over a short distance that would be suitable for a project, however the project output is indeterminate.

The available energy is based on the determination of the percentage of the mean annual flow available for power generation in a run of river situation times the available power, which accounts for seasonal variations in flow and assumes that all energy produced can be delivered to the grid. Higher energy outputs originate from streams that are coastal (60-70% of the theoretical maximum based on design flow being available all the time) or have lakes providing storage while low outputs tend to result from areas where there is a pronounced spring runoff coupled with dry summers and cold winters (25-40% of the theoretical maximum).

The original 1983 inventory did not make any allowance for instream flow releases to protect the stream environment. This inventory has been adjusted to provide for flow releases consistent with BC Hydro's criteria shown in Appendix 1. The 20% of the daily flow that is to be left in the stream provides for at least a 10% reduction in energy output at every project site, compared with the original inventory. The amount of energy reduction can be demonstrated on the two flow duration curves (**Figures 1** and **2**) included in **Appendix 1**. The coastal stream has frequent rains and higher base flows with a resulting energy reduction of 10.4% due to fish flows. The interior stream has a pronounced snowmelt runoff and very low flows at times of the year, resulting in a 10.0% energy reduction due to fish flows. In the calculations a reduction of 10% is used for all streams. Sometimes very low flows will require the plant to be shut down because some turbines cannot operate well at low flows. This will be a site specific determination and no allowance has been made because most of the sites are smaller high head sites which use impulse turbines that can operate over a wide flow range.

Since the development of the 1983 inventory experience with the independent power industry has shown that there are other projects developable which were not included in the inventory. In some instances, extensions of the provincial grid have made it possible for more projects to be economically connected. In other situations, developers have taken a creative approach to developing head, say by using tunnels and diversions to shorten what may otherwise have been a long penstock. Still other developers have optimized the sizing of the project by adapting the length of penstock to the most opportune location to develop the most head with the least amount of penstock length. The present inventory is limited to a map study and thus cannot duplicate the in depth study that eventually should be done with any project site. Some of the requirements of the in depth study needed for feasibility and optimization are described at the end of this section.

This inventory can be used in a number of different ways, depending on the needs of the user. Its main purpose is to assist individuals in finding projects in their own geographical area or other specified areas. There is no substitute for field investigation, hence each site must be checked in the field and a program of improving on the available data must be undertaken to allow more accurate estimates of costs and output. Finding a suitable site is just the beginning, for the next steps include developing a power sales contract, permitting, design, construction contracts and financing. (See Handbook for an overview of these activities.)

Agencies may use the information to provide an overview of the numbers of projects in different capacity ranges, aggregate capacity and energy potential, investment potential, and development potential at difference electricity prices. The economic potential may be further refined by taking the distribution of investments into the different components of the projects. The tables provided show the typical cost distributions in different classes of project.

It was noted in Section 2 that there was a degree of imprecision in the determination of a cutoff size of 2 MW. It is for this reason that the database has been expanded to provide listings of projects in the 2-5 MW size, to ensure that there are projects above and below the 2 MW cutoff. In this inventory the sizing of a project is determined by specifying the head and the design flow which are in turn based on preliminary information. However it should be recognized that real projects are optimized to account for the following factors:

- Provision of detailed mapping may optimize the head of the project higher or lower providing a direct impact on power output;
- Detailed hydrology studies may provide better information on which to judge available flows and especially the seasonality of the flows;
- The nature of the power contract may influence the size of the development. For example, if spring and summer power was more valuable, projects that had a strong spring runoff would be developed at a higher capacity;
- Procurement opportunities may lead to sizing the project differently (usually higher) if good pricing for equipment of a size larger than that requested is offered by the supplier;
- Instream fish flow allowances could be larger or smaller than the estimates, depending on the requirements of site specific biological data.

Thus there could be projects that moved from lower than 2 MW to greater than 2 MW and vice versa depending on the noted factors. It should also be noted that the average energy output of a 2 MW project will be somewhat less than 2 MW to account for the site specific flows.

4. MICRO HYDRO DATABASE

The database is divided in two tables: **Table 4.1** shows sites with potential installed capacity less than 2 MW without allowing for 20% diversion for green generation and **Table 4.2** shows sites with potential installed capacity from 2 MW to 5 MW, also without allowing for 20% diversion. The inventory of small hydro sites is presented alphabetically by region. **Tables 4.1a** and **4.2a** contain the same information as Tables 4.1 and 4.2 respectively, sorted by cost ($/kWh). The following information is provided for each site:

- **Stream Name** — The stream name
- **Lat/Long** — Latitude and longitude of the site.
- **Region** — Number of region where the site is (see **Figure 4.1**)
- **Flow** — Mean annual flow (m^3/s)
- **Head** — Estimated vertical distance between intake and powerhouse in metres. Sites with less than 30m of head were not analyzed because of mapping limitations.
- **Penstock L** — Estimated penstock length in metres.
- **Penstock D** — Penstock diameter in metres.
- **Power** — Estimated installed capacity in kilowatts.
- **Cost** — Estimated total capital cost in thousands of dollars, including the transmission line.
- **Transm. Dist.** — Transmission line distance in km.
- **Capacity Factor** — Ratio of average power output / peak capacity
- **Energy** — Annual generation in gigawatt hours (using mean annual flow) and capacity factor.
- **Fish flow factor** — Ratio indicating the mean annual energy available in the stream allowing for fish flow requirements in accordance with BC Hydro's criteria for Green Micro-Hydro Generation (see Appendix 1).
- **Green Energy** — Annual generation in gigawatt hours (Energy multiplied by Fish flow factor)
- **Green Energy Cost** — Average cost of power production in $/kWh. For comparison only (see comments below).

The **capital cost** of each small hydro project is based on a combination of experience curves, cost curves and unit price data, all adjusted to year 2000 price data. Separate cost curves are used for penstocks, intakes, powerhouses, and transmission lines. The accessibility of the sites is taken into account by the use of a site factor as shown below. Percentages are applied to the total for engineering services and contingency allowance.

The **cost of power** is estimated by dividing the annual cost of the project by the average 'green' energy generated each year. The annual cost of the project reflects the levelized capital costs at an 8% real discount rate, assuming a 40 year project life and adding 1% of the original capital cost for annual maintenance and operating expenses. No interest-during-construction costs were included, but these are likely to be relatively small given the short construction time for most projects. Taxes and water rents were not included and the point of sale is considered to be the grid, so wheeling charges are not included.

(Levelized costs refer to the constant amount which if charged on each unit of energy produced over the life of the facility, would generate annual revenues equal in present value to the original capital costs. The levelized costs in this study are calculated on the basis of a real (net of inflation) discount rate and therefore refer to a charge per kWh, which is constant in real terms. One would have to escalate this constant charge by the rate of inflation to calculate the current dollar amount it corresponds to each year over the life of the project.)

The **annual 'green' energy generation** is taken as the total number of GWh of energy which could be generated in a year. It is assumed that the plant will generate at a rate equivalent to the energy available in the water, up to the installed capacity. For run of river plants with no storage, this is taken as the theoretical annual energy (based on full generation at the installed capacity) multiplied by the capacity factor (which accounts for the periods when there is insufficient flow to meet the installed capacity) and by a fish flow factor (which accounts for the required fish flow, that cannot be used for generation). Effectively the cost per kWh of green energy is higher by the ratio 1/Fish Flow Factor. The installed capacity is the same as for full utilization of the water, since there are times when there is enough water available to allow for fish release and full generation.

The resulting cost of power ($/kWh) is a means of comparing different sites with a common parameter, and relating the cost to current rates payable for power. Once a project has been studied further, the actual unit cost of power must be determined by a more detailed financial analysis.

In summary, the Total Project Cost is calculated in the following way:

Penstock Cost
Intake Cost
Powerhouse Cost
Subtotal 1

(Site Factor) x **Subtotal 1**
Generating Equipment Cost
Access Road Cost
Subtotal 2

Engineering (20% of Subtotal 2)
Contingency (30% of Subtotal 2)
Subtotal 3

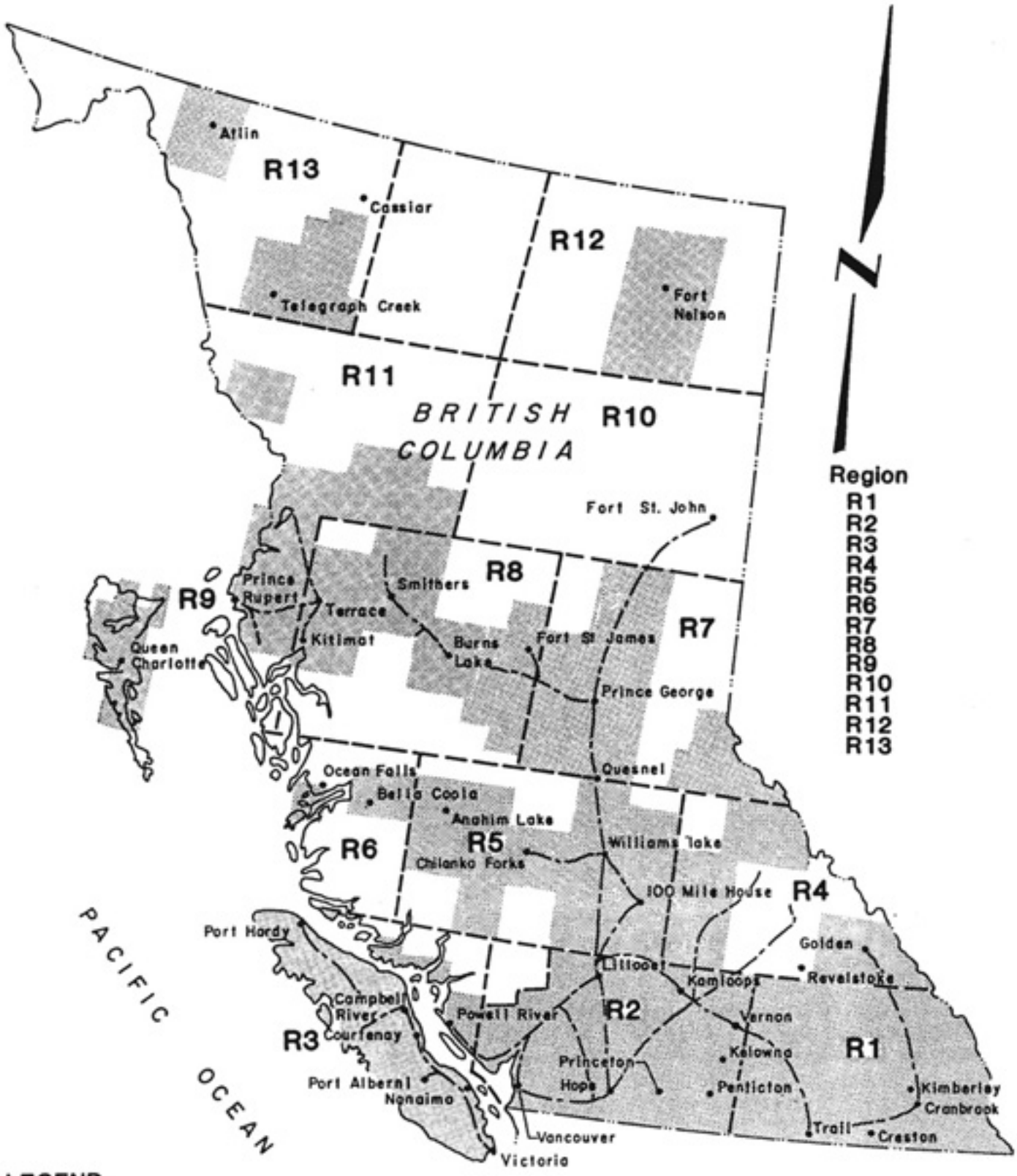
Transmission Line Cost
Engineering (15% of Transmission Line Cost)
Contingency (20% of Transmission Line Cost)
Total Capital Cost

The Site Factor was applied to the standard unit costs to account for the higher construction cost that a contractor will face on isolated sites. It ranges from 1.0 for a site near a large city, to 1.5 for an isolated site as shown below.

Typical BC Site Factors

Within 1/2 hour drive of City > 50,000 population	1.0
Within 1 hour drive of City > 50,000 population	1.1
Within 1/2 hour drive of Town < 50,000 population	1.2
Within 1 hour drive of Town < 50,000 population	1.3
Fly or barge in	1.4
Fly in only from anywhere	1.5

Engineering includes all the engineering work such as site visits, preliminary and final design, permitting and approvals, tendering, engineering during construction, inspection and commissioning. Contingency accounts for weather related events or probable increase in material or labour costs that could affect the estimated cost of the project, as well as potential design changes during construction.



LEGEND

- Existing transmission line (High voltage)
- Areas studied for grid tie in
- Boundary of Region (as used in study)

LOCATION MAP FOR REGIONS

FIGURE 4.1

TABLE 4.1 Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
1	ARTHURS CR	4941/11843	1	0.4	280	2000	0.44	900	5,377	50	40%	3.2	0.90	2.8	0.178
2	ASSINIBOINE CR	5048/11540	1	0.53	240	1500	0.48	1,000	8,881	47	50%	4.4	0.90	3.9	0.211
3	BEHRMAN CR	5030/11652	1	0.7	240	850	0.88	1,300	4,852	34	50%	5.7	0.90	5.1	0.089
4	BEN ABLE CR	5016/11609	1	0.63	180	1400	0.53	900	5,221	33	50%	3.9	0.90	3.5	0.138
5	BRUCE CR	5034/11615	1	2.4	50	400	0.88	900	4,446	12	52%	4.1	0.90	3.7	0.113
6	CHAMPION CR	4914/11735	1	0.95	92	500	0.58	700	2,189	4	40%	2.5	0.90	2.2	0.093
7	CHRISTIAN CR	5024/11848	1	0.19	200	900	0.36	300	1,497	2	45%	1.2	0.90	1.1	0.132
8	COPPERCROWN CR	5022/11621	1	0.3	183	1000	0.41	400	2,338	24	50%	1.8	0.90	1.6	0.139
9	CORN CR	4904/11640	1	2.3	60	800	0.96	1,100	3,326	4	55%	5.3	0.90	4.8	0.065
10	CREIGHTON CR	5012/11846	1	0.3	200	1800	0.39	500	1,705	2	47%	2.1	0.90	1.9	0.086
11	DAVIS CR	5008/11657	1	0.8	122	500	0.52	800	1,578	0.5	47%	3.3	0.90	3.0	0.050
12	DENNIS CR	5002/11722	1	0.71	182	1250	0.55	1,000	2,641	2	45%	3.9	0.90	3.5	0.070
13	DOG CR	4924/11807	1	1.3	50	400	0.71	500	3,687	35	40%	1.8	0.90	1.6	0.219
14	DRUMMIE CR	5052/11805	1	1.3	150	700	0.63	1,500	2,549	7	45%	5.9	0.90	5.3	0.045
15	EAST CR	5042/11653	1	2.9	50	500	0.99	1,100	8,637	72	52%	5.0	0.90	4.5	0.180
16	FALL CR	5036/11853	1	0.45	500	1000	0.41	1,800	2,347	1.5	45%	7.1	0.90	6.4	0.034
17	FENWICK CR	5028/11537	1	2	50	650	0.91	800	4,495	40	50%	3.5	0.90	3.2	0.134
18	FERRY CR	5015/11839	1	1.1	150	3100	0.78	1,300	4,060	1	51%	5.8	0.90	5.2	0.073
19	GILLIS CR	5004/11642	1	1.8	120	1200	0.82	1,700	6,624	14	50%	7.4	0.90	6.7	0.093
20	GOATSKIN CR	4943/11839	1	1.2	100	1000	0.71	900	6,270	60	50%	3.9	0.90	3.5	0.166
21	HALL CR	5041/11706	1	1.8	100	850	0.8	1,400	4,784	51	53%	6.5	0.90	5.8	0.077
22	HIDDEN CR	4914/11710	1	1.5	30	250	0.75	400	2,005	5	40%	1.4	0.90	1.3	0.149
23	HOLSTEIN CR	5018/11835	1	0.29	150	1200	0.41	300	1,605	1	45%	1.2	0.90	1.1	0.142
24	HOPE CR	5028/11711	1	0.76	240	1250	0.53	1,400	3,692	24	47%	5.8	0.90	5.2	0.067
25	HUNTERS CR	5041/11847	1	1.3	150	1900	0.77	1,500	4,431	10	45%	5.9	0.90	5.3	0.078
26	IRON CR	5043/11836	1	0.22	550	2000	0.36	900	2,736	22	47%	3.7	0.90	3.3	0.077
27	JOHN CR	5016/11701	1	0.62	180	1200	0.51	900	2,207	4.5	47%	3.7	0.90	3.3	0.062
28	KAIN CR	5051/11635	1	0.95	250	1100	0.56	1,900	3,792	16	52%	8.7	0.90	7.8	0.046
29	LADYBIRD CR	4925/11740	1	2	120	600	0.76	1,900	2,959	2.5	40%	6.7	0.90	6.0	0.046
30	LEGERWOOD CR	5058/11846	1	0.53	250	1300	0.47	1,000	2,594	1.5	45%	3.9	0.90	3.5	0.069
31	LEXINGTON CR	5050/11737	1	0.55	450	1700	0.45	1,900	6,005	58	53%	8.8	0.90	7.9	0.071
32	LITTLE GLACIER CR	5026/11655	1	1.3	60	600	0.72	600	2,940	26	50%	2.6	0.90	2.4	0.117
33	LOFTUS CR	5056/11849	1	0.75	250	1000	0.51	1,500	2,378	0.5	45%	5.9	0.90	5.3	0.042
34	LOST LEDGE CR	5006/11656	1	0.28	430	1700	0.36	900	1,639	0.5	47%	3.7	0.90	3.3	0.046
35	LUXOR CR	5046/11610	1	0.97	100	1400	0.7	800	2,802	3	52%	3.6	0.90	3.3	0.080
36	MABLE CR	5037/11836	1	0.22	250	800	0.36	400	2,447	11	47%	1.6	0.90	1.5	0.155
37	MEADOW CR	5018/11703	1	0.62	180	1300	0.52	900	2,498	4	47%	3.7	0.90	3.3	0.070
38	MENHINICK CR	5049/11739	1	0.6	200	900	0.47	900	4,375	53	53%	4.2	0.90	3.8	0.109
39	MIDGE CR	4922/11652	1	5.6	30	1000	1.6	1,300	7,472	33	55%	6.3	0.90	5.6	0.124

TABLE 4.1 Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
40	MURPHY CR	4910/11744	1	0.95	60	500	0.63	400	1,503	2.5	40%	1.4	0.90	1.3	0.112
41	OCTOPUS CR	4945/11806	1	0.68	150	650	0.49	800	2,255	6	40%	2.8	0.90	2.5	0.084
42	OUTLET CR	5020/11830	1	0.6	150	1400	0.54	700	2,607	3	45%	2.8	0.90	2.5	0.099
43	PAYNE CR	5037/11751	1	1.6	100	400	0.67	1,300	3,676	45	53%	6.0	0.90	5.4	0.064
44	QUARRIE CR	5016/11459	1	1.2	50	550	0.72	500	2,438	12	50%	2.2	0.90	2.0	0.116
45	RIOULX CR	5017/11805	1	0.9	200	2000	0.64	1,400	5,975	30	45%	5.5	0.90	5.0	0.113
46	SCHROEDER CR	5002/11653	1	0.64	300	2300	0.53	1,500	3,502	0.5	47%	6.2	0.90	5.6	0.059
47	SEPTET CR	5048/11641	1	1.4	150	950	0.69	1,600	4,365	34	52%	7.3	0.90	6.6	0.062
48	SLEWISKIN CR	5008/11747	1	3.4	60	1200	1.2	1,600	4,188	2	45%	6.3	0.90	5.7	0.069
49	SMYTH CR	5032/11843	1	0.29	600	2000	0.36	1,400	2,874	15	45%	5.5	0.90	5.0	0.054
50	SOWSAP CR	5026/11846	1	0.42	200	2100	0.49	700	2,774	3.5	45%	2.8	0.90	2.5	0.105
51	STEWART CR	4907/11815	1	0.19	250	1050	0.31	400	2,198	8	40%	1.4	0.90	1.3	0.164
52	STOCKDALE CR	5035/11635	1	2.6	50	700	1	1,000	6,299	38	52%	4.6	0.90	4.1	0.144
53	TEMPLETON CR	5048/11629	1	1	250	1700	0.62	2,000	5,615	21	52%	9.1	0.90	8.2	0.064
54	TOWN CR	5046/11745	1	0.49	400	1400	0.44	1,500	4,364	44	53%	7.0	0.90	6.3	0.065
55	UNNAMED CR	5021/11648	1	0.3	240	900	0.36	600	2,076	19	50%	2.6	0.90	2.4	0.082
56	UNNAMED CR	5020/11651	1	0.28	300	1150	0.36	700	2,054	14	50%	3.1	0.90	2.8	0.070
57	UNNAMED CR	4959/11600	1	0.16	560	1550	0.31	700	3,334	33	40%	2.5	0.90	2.2	0.142
58	UNNAMED CR	5006/11646	1	0.18	550	1650	0.31	800	2,095	8	50%	3.5	0.90	3.2	0.062
59	UNNAMED CR	5007/11644	1	0.22	490	1400	0.3	800	2,336	13	50%	3.5	0.90	3.2	0.070
60	UNNAMED CR	5009/11638	1	0.46	240	1000	0.44	900	3,870	21	50%	3.9	0.90	3.5	0.102
61	UNNAMED CR	5021/11651	1	0.32	430	2000	0.41	1,100	2,971	15	55%	5.3	0.90	4.8	0.058
62	UNNAMED CR	5058/11836	1	0.5	300	700	0.4	1,200	1,721	7	45%	4.7	0.90	4.3	0.038
63	UNNAMED CR	5055/11807	1	0.85	250	1150	0.54	1,700	2,755	1	45%	6.7	0.90	6.0	0.043
64	UNNAMED CR	4959/11603	1	0.75	300	1100	0.5	1,800	5,040	37	40%	6.3	0.90	5.7	0.083
65	VAN HOUTEN CR	4940/11807	1	0.57	150	700	0.47	700	3,099	16	40%	2.5	0.90	2.2	0.132
66	VICTOR CR	5057/11824	1	0.5	300	550	0.4	1,200	1,607	6	45%	4.7	0.90	4.3	0.035
67	ANDERSON CR	4911/12143	2	0.21	850	1500	0.31	1,400	3,035	5	63%	7.7	0.90	7.0	0.041
68	BASTION CR	5051/11905	2	0.24	300	1000	0.36	600	1,809	17	45%	2.4	0.90	2.1	0.080
69	BLURTON CR	5041/11902	2	0.48	400	1600	0.44	1,500	2,383	1	45%	5.9	0.90	5.3	0.042
70	BOBB CR	5051/12233	2	0.8	300	1400	0.53	1,900	6,100	22	52%	8.7	0.90	7.8	0.074
71	BREMNER CR	4940/12201	2	3.1	60	200	0.83	1,500	2,747	7	55%	7.2	0.90	6.5	0.040
72	CADWALLADER CR	5046/12248	2	4.8	50	600	1.2	1,900	4,284	0.5	52%	8.7	0.90	7.8	0.052
73	CHASE CR	5049/11941	2	0.99	100	500	0.58	800	1,591	0	45%	3.2	0.90	2.8	0.053
74	CHEEKYE R	4948/12306	2	1.7	120	1200	0.81	1,600	4,279	7	55%	7.7	0.90	6.9	0.058
75	CORNING CR	5054/11932	2	0.52	100	700	0.49	400	1,251	0	45%	1.6	0.90	1.4	0.083
76	CYPRESS CR	4920/12314	2	1.3	105	825	0.7	1,100	1,782	0	55%	5.3	0.90	4.8	0.035
77	DURUISEAU CR	4905/12021	2	0.29	250	1600	0.41	600	2,806	24	45%	2.4	0.90	2.1	0.124
78	EATON CR	4915/12123	2	0.3	850	2150	0.36	2,000	4,525	16	63%	11.0	0.90	9.9	0.043

TABLE 4.1 Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
79	FOLEY CR	4908/12133	2	0.85	240	2800	0.64	1,600	5,977	14	60%	8.4	0.90	7.6	0.074
80	HICKS CR	4911/12121	2	0.81	120	900	0.58	800	3,179	25	63%	4.4	0.90	4.0	0.075
81	HILLS CR	5043/11904	2	0.68	250	1250	0.51	1,300	2,831	3	45%	5.1	0.90	4.6	0.058
82	HUMMING BIRD CR	5046/11900	2	0.3	250	750	0.36	600	1,103	1	45%	2.4	0.90	2.1	0.049
83	KEARY CR	5049/12225	2	0.6	400	2800	0.52	1,900	5,839	12	52%	8.7	0.90	7.8	0.070
84	LAFORGUE CR	4914/12109	2	0.62	300	1200	0.47	1,500	4,498	27	60%	7.9	0.90	7.1	0.059
85	LAKEVIEW CR	4909/12010	2	0.32	550	2900	0.41	1,400	4,818	20	45%	5.5	0.90	5.0	0.091
86	MAIMEN CR	4917/12124	2	0.39	610	3150	0.44	1,900	4,762	11	60%	10.0	0.90	9.0	0.050
87	MARA CR	5046/11900	2	0.46	250	1000	0.44	900	1,389	1	45%	3.5	0.90	3.2	0.041
88	MOWHOKAM CR	5002/12131	2	1.4	100	1000	0.76	1,100	3,021	3	50%	4.8	0.90	4.3	0.065
89	NOEL CR	5046/12248	2	3.2	50	400	0.99	1,300	3,310	2	52%	5.9	0.90	5.3	0.058
90	PAUL CR	4915/12001	2	0.67	120	400	0.47	600	2,190	1	40%	2.1	0.90	1.9	0.109
91	PAVILION CR	5054/12146	2	0.15	350	2350	0.36	400	1,686	0	50%	1.8	0.90	1.6	0.100
92	PLACER CR	4911/12034	2	0.69	250	1900	0.55	1,400	4,218	25	45%	5.5	0.90	5.0	0.080
93	POST CR	4905/12128	2	1.1	125	500	0.59	1,100	2,971	17	60%	5.8	0.90	5.2	0.054
94	POTLATCH CR	4935/12319	2	0.43	150	1300	0.47	500	2,061	1	55%	2.4	0.90	2.2	0.089
95	RED CR	4931/12023	2	0.28	260	1250	0.41	600	2,372	4	40%	2.1	0.90	1.9	0.118
96	REINECKER CR	5047/11913	2	0.96	100	500	0.58	800	1,903	4	45%	3.2	0.90	2.8	0.063
97	SHAKAN CR	5016/12112	2	0.86	50	200	0.53	300	1,447	2	43%	1.1	0.90	1.0	0.134
98	SHULAPS CR	5056/12217	2	0.58	200	1550	0.52	900	4,244	30	52%	4.1	0.90	3.7	0.108
99	SWANEE CR	4915/12123	2	0.23	460	1900	0.36	800	2,616	17	60%	4.2	0.90	3.8	0.065
100	TEXAS CR	5031/12150	2	2.3	100	800	0.87	1,800	4,963	23	50%	7.9	0.90	7.1	0.066
101	TRETHEWAY CR	4942/12205	2	7.5	30	150	1.3	1,800	4,228	0	55%	8.7	0.90	7.8	0.051
102	TRUAX CR	5053/12238	2	1	200	700	0.55	1,600	2,936	18	52%	7.3	0.90	6.6	0.042
103	UNNAMED CR	4905/12043	2	0.18	150	825	0.36	200	1,477	11	50%	0.9	0.90	0.8	0.176
104	UNNAMED CR	4918/12004	2	0.08	600	1300	0.2	400	1,380	1	40%	1.4	0.90	1.3	0.103
105	UNNAMED CR	4941/12335	2	0.18	793	1800	0.31	1,100	2,585	0	57%	5.5	0.90	4.9	0.049
106	UNNAMED CR	4940/12335	2	0.15	1037	2400	0.25	1,200	3,276	0	60%	6.3	0.90	5.7	0.054
107	UNNAMED CR	4915/12115	2	0.93	180	1300	0.61	1,300	3,935	25	60%	6.8	0.90	6.1	0.060
108	UNNAMED CR	4944/12332	2	0.44	397	700	0.41	1,400	2,082	5	55%	6.7	0.90	6.1	0.032
109	UNNAMED CR	4912/12120	2	0.26	670	2050	0.36	1,400	4,230	24	63%	7.7	0.90	7.0	0.057
110	UNNAMED CR	4929/12125	2	0.45	425	2600	0.45	1,500	3,769	3	60%	7.9	0.90	7.1	0.050
111	UNNAMED CR	4909/12115	2	0.9	245	1500	0.59	1,700	4,885	30	63%	9.4	0.90	8.4	0.054
112	UNNAMED CR	4941/12316	2	0.41	580	1700	0.41	1,900	3,717	2.5	55%	9.2	0.90	8.2	0.042
113	WHITE CR	5051/11919	2	0.6	50	300	0.5	200	1,005	0	60%	1.1	0.90	0.9	0.100
114	WHITECAP CR	5043/12218	2	0.73	200	950	0.52	1,100	2,415	1	52%	5.0	0.90	4.5	0.050
115	WILLIS CR	4925/12025	2	0.6	150	1200	0.53	700	2,819	9	45%	2.8	0.90	2.5	0.107
116	WRAY CR	4920/12118	2	0.83	305	2000	0.57	2,000	4,670	12	60%	10.5	0.90	9.5	0.046
117	ZENITH CR	4952/12316	2	0.11	1159	2800	0.25	1,000	4,133	15	60%	5.3	0.90	4.7	0.082

TABLE 4.1 Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
118	ADRIAN CR	4948/12527	3	1.8	50	625	0.87	700	2,352	0	65%	4.0	0.90	3.6	0.062
119	AHAMINGUS CR	4941/12607	3	0.99	40	100	0.52	300	1,155	0.5	65%	1.7	0.90	1.5	0.071
120	ARTLISH R	5008/12655	3	5.9	30	600	1.5	1,400	6,955	30	65%	8.0	0.90	7.2	0.091
121	ATLUCK CR	5018/12656	3	8.6	30	700	1.7	2,000	6,362	16	65%	11.4	0.90	10.2	0.058
122	BANCROFT	4934/12552	3	2.2	100	560	0.8	1,700	6,940	26	65%	9.7	0.90	8.7	0.075
123	BARR CR	4955/12647	3	3.5	30	400	1.1	800	4,426	10	65%	4.6	0.90	4.1	0.101
124	BEDWELL R	4927/12536	3	3.1	50	500	1	1,200	4,313	32	62%	6.5	0.90	5.9	0.069
125	BEECH CR	4936/12512	3	1.3	50	125	0.57	500	1,494	8.2	65%	2.8	0.90	2.6	0.055
126	BIG TREE	5015/12545	3	1.7	100	1900	0.92	1,300	3,889	1.5	67%	7.6	0.90	6.9	0.053
127	BRODRICK CR	4950/12653	3	1.4	120	1650	0.79	1,300	4,520	21	65%	7.4	0.90	6.7	0.064
128	BURMAN R	4936/12550	3	4.4	50	250	1	1,700	6,950	26	65%	9.7	0.90	8.7	0.075
129	BUTTERWORT/ELK CR	4948/15553	3	2.6	50	375	0.91	1,000	4,020	6.3	65%	5.7	0.90	5.1	0.074
130	CANTON CR	4949/12628	3	3.1	30	800	1.2	700	3,447	1.5	65%	4.0	0.90	3.6	0.090
131	CANTON CR EAST	4950/12628	3	1.1	30	150	0.61	300	1,816	4.4	65%	1.7	0.90	1.5	0.111
132	CANTON CR WEST	4950/12628	3	2	30	300	0.86	500	2,587	4	65%	2.8	0.90	2.6	0.095
133	CIRIACO CR	4956/12649	3	0.49	90	550	0.46	300	2,422	8	65%	1.7	0.90	1.5	0.148
134	CLUXEWE R	5029/12709	3	1.8	60	550	0.82	800	2,951	11	65%	4.6	0.90	4.1	0.068
135	COMOX CR	4932/12515	3	2	50	125	0.67	800	2,525	18	65%	4.6	0.90	4.1	0.058
136	CRAFT CR	5024/12715	3	1.2	180	1800	0.71	1,700	4,764	18	65%	9.7	0.90	8.7	0.051
137	DICK BOOTH CR	5041/12731	3	1.3	90	1500	0.82	900	3,054	2.5	68%	5.4	0.90	4.8	0.059
138	DRINKWATER CR	4926/12530	3	3.3	50	250	0.92	1,300	5,156	23	62%	7.1	0.90	6.4	0.076
139	EHATISAHT CR	4953/12651	3	1.5	60	800	0.82	700	5,155	17	65%	4.0	0.90	3.6	0.135
140	FAIRY CR	4836/12420	3	0.55	50	125	0.44	200	1,254	5.5	51%	0.9	0.90	0.8	0.146
141	FELLOWS CR	4840/12353	3	0.45	50	250	0.44	200	1,710	15	51%	0.9	0.90	0.8	0.200
142	FLEET CR	4835/12403	3	5	50	750	1.3	2,000	5,429	24	51%	8.9	0.90	8.0	0.063
143	FRIEND CR	4958/12648	3	0.38	90	300	0.41	300	1,229	3	65%	1.7	0.90	1.5	0.075
144	HEADQUARTERS CR	4942/12507	3	1.5	50	250	0.68	600	1,668	1.4	65%	3.4	0.90	3.1	0.051
145	HECTATE LAKE	4953/12647	3	1.1	30	500	0.76	300	2,359	16	65%	1.7	0.90	1.5	0.144
146	HENSHAW CR #1	4936/12532	3	2.5	50	500	0.94	1,000	4,764	43	65%	5.7	0.90	5.1	0.087
147	HENSHAW CR #2	4936/12532	3	2.6	50	500	0.95	1,000	4,591	43	65%	5.7	0.90	5.1	0.084
148	HESQUIAT PT CR	4925/12623	3	1.5	40	700	0.87	500	4,112	38	65%	2.8	0.90	2.6	0.151
149	HOISS CR	4942/12634	3	1.3	60	950	0.8	600	3,332	17	65%	3.4	0.90	3.1	0.102
150	KAOUK R	5005/12652	3	3.6	60	1400	1.3	1,700	6,108	18	65%	9.7	0.90	8.7	0.066
151	KASHULT CR	5012/12719	3	1.5	60	950	0.83	700	4,261	32	64%	3.9	0.90	3.5	0.113
152	KAUWINCH R	5014/12716	3	1.2	120	900	0.68	1,100	4,684	24	64%	6.2	0.90	5.6	0.079
153	KENDRICK CR	4944/12639	3	1.6	30	620	0.91	400	3,435	23	65%	2.3	0.90	2.0	0.157
154	KILPALA R	5026/12703	3	4.1	60	1700	1.4	1,900	9,575	17	65%	10.8	0.90	9.7	0.092
155	KINMAN CR	5021/12655	3	1.5	90	1050	0.8	1,100	3,549	21	68%	6.6	0.90	5.9	0.056
156	LEINER R	4956/12637	3	8.1	30	350	1.5	1,900	4,986	4	65%	10.8	0.90	9.7	0.048

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No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
157	LUTES CR	4953/12646	3	1.5	60	450	0.74	700	3,878	14	65%	4.0	0.90	3.6	0.101
158	MACKTUSH CR	4906/12451	3	2.9	50	625	1	1,100	3,104	10	62%	6.0	0.90	5.4	0.054
159	MALKSOPE R	5010/12722	3	1.1	60	1050	0.77	500	3,607	26	64%	2.8	0.90	2.5	0.134
160	MAMAT CR	4959/12655	3	0.63	60	600	0.56	300	1,889	6	65%	1.7	0.90	1.5	0.115
161	MARBLE R	5016/12720	3	0.93	60	900	0.7	400	3,925	17	65%	2.3	0.90	2.0	0.180
162	MARGARET CR	4926/12527	3	2.9	50	250	0.87	1,100	4,931	23	62%	6.0	0.90	5.4	0.086
163	MATCHLEE CR	4939/12603	3	1.4	40	100	0.59	400	3,444	11	65%	2.3	0.90	2.0	0.158
164	MCKELVIE CR	4956/12639	3	2.4	90	600	0.86	1,700	3,011	4	65%	9.7	0.90	8.7	0.032
165	MEGIN R TRIBUTARY	4932/12601	3	1.3	40	275	0.69	400	5,087	47	65%	2.3	0.90	2.0	0.233
166	MEMEKAY R	5010/12547	3	4.1	50	1000	1.3	1,600	4,591	7.5	67%	9.4	0.90	8.5	0.051
167	MOOYAH R	4937/12625	3	1.7	40	900	0.95	500	3,997	32	65%	2.8	0.90	2.6	0.146
168	MUCHALAT R	4935/12619	3	2	60	350	0.78	900	3,527	12	65%	5.1	0.90	4.6	0.072
169	NAKA CR	5028/12625	3	3.2	60	750	1.1	1,500	7,024	31	64%	8.4	0.90	7.6	0.087
170	NARROWGUT CR	5000/12707	3	1.8	30	400	0.87	400	4,057	27	65%	2.3	0.90	2.0	0.186
171	NEWCASTLE CR	5022/12607	3	2	90	850	0.85	1,400	3,600	15	64%	7.8	0.90	7.1	0.048
172	NOR/MID MEMEKAY R	5011/12547	3	4.1	50	1250	1.3	1,600	6,022	5.5	67%	9.4	0.90	8.5	0.067
173	NORA CR	5008/12602	3	1.1	152	1200	0.67	1,300	3,981	22	64%	7.3	0.90	6.6	0.057
174	OKTWANCH R	4947/12615	3	1.6	30	400	0.83	400	2,072	0.9	65%	2.3	0.90	2.0	0.095
175	OUOUKINSH R	5013/12725	3	0.92	120	1100	0.63	900	4,616	21	64%	5.0	0.90	4.5	0.095
176	PALMERSTON ST	5027/12616	3	1.7	90	725	0.79	1,200	4,106	28	64%	6.7	0.90	6.1	0.064
177	PEGGATTEM CR	5038/12759	3	1.5	30	550	0.87	400	3,282	29	68%	2.4	0.90	2.1	0.144
178	PERRY R	4954/12637	3	5.2	30	600	1.4	1,200	3,963	3	65%	6.8	0.90	6.1	0.060
179	PRETTY GIRL L	4930/12614	3	1.7	80	400	0.72	1,100	3,910	32	65%	6.3	0.90	5.6	0.065
180	RALPH R	4938/12531	3	1.7	50	375	0.78	700	3,777	39	65%	4.0	0.90	3.6	0.099
181	SAN JUAN R	4836/12359	3	2.3	50	750	0.97	900	3,558	18	51%	4.0	0.90	3.6	0.092
182	SEBALHALL CR	4947/12624	3	2.5	30	400	0.99	600	3,116	10	65%	3.4	0.90	3.1	0.095
183	SHEPHERD CR	4938/12531	3	3.2	50	500	1	1,300	4,812	39	65%	7.4	0.90	6.7	0.068
184	SHUSHARTIE R	5049/12752	3	4.9	30	750	1.4	1,200	6,119	28	68%	7.1	0.90	6.4	0.089
185	SOMBRIO R	4831/12417	3	0.87	50	380	0.6	300	1,365	0.5	51%	1.3	0.90	1.2	0.106
186	SONGHEES CR	5047/12735	3	4.5	30	450	1.3	1,100	4,401	8	68%	6.6	0.90	5.9	0.070
187	SWAH CR	5001/12620	3	1.4	60	700	0.78	700	2,113	1.9	65%	4.0	0.90	3.6	0.055
188	TABOLT CR TRIB	4930/12606	3	1.5	40	250	0.71	500	3,117	28	65%	2.8	0.90	2.6	0.114
189	TAHSISH R	5016/12705	3	3.7	30	500	1.2	900	5,202	45	65%	5.1	0.90	4.6	0.106
190	TAHSISH R	5013/12703	3	3	60	500	0.97	1,400	5,069	45	64%	7.8	0.90	7.1	0.067
191	TEIHSUM R	5020/12721	3	2.3	60	1700	1.1	1,100	5,382	17	65%	6.3	0.90	5.6	0.090
192	TLOOLS CR	4952/12545	3	3	50	625	1.1	1,200	2,971	1	65%	6.8	0.90	6.1	0.045
193	TRENT R	4935/12459	3	2	50	880	0.95	800	2,781	4	65%	4.6	0.90	4.1	0.064
194	TUGWELL CR	4825/12350	3	0.65	50	625	0.59	300	1,784	5	51%	1.3	0.90	1.2	0.139
195	UNNAMED CR	4924/12617	3	0.38	40	150	0.41	100	2,242	29	65%	0.6	0.90	0.5	0.411

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No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
196	UNNAMED CR	4955/12648	3	0.49	30	90	0.44	100	2,153	9	65%	0.6	0.90	0.5	0.394
197	UNNAMED CR	4923/12607	3	0.41	40	400	0.48	100	1,867	13	65%	0.6	0.90	0.5	0.342
198	UNNAMED CR	4921/12601	3	0.37	40	250	0.44	100	2,210	16	65%	0.6	0.90	0.5	0.405
199	UNNAMED CR	4927/12605	3	0.57	40	220	0.48	200	2,562	30	65%	1.1	0.90	1.0	0.235
200	UNNAMED CR	4923/12604	3	0.77	40	300	0.57	200	2,110	17	65%	1.1	0.90	1.0	0.193
201	UNNAMED CR	4952/12650	3	1	30	350	0.69	200	2,210	19	65%	1.1	0.90	1.0	0.202
202	UNNAMED CR	4917/12610	3	0.79	40	375	0.6	200	1,933	6.5	67%	1.2	0.90	1.1	0.172
203	UNNAMED CR	4919/12605	3	0.41	80	550	0.44	300	1,560	4.5	65%	1.7	0.90	1.5	0.095
204	UNNAMED CR	4917/12610	3	0.84	40	600	0.67	300	2,333	6.5	65%	1.7	0.90	1.5	0.142
205	UNNAMED CR	4948/12625	3	1.2	30	200	0.65	300	1,310	0.5	65%	1.7	0.90	1.5	0.080
206	UNNAMED CR	4950/12538	3	0.9	50	375	0.61	400	2,304	14	65%	2.3	0.90	2.0	0.105
207	UNNAMED CR	5013/12605	3	0.9	55	900	0.69	400	2,527	13	64%	2.2	0.90	2.0	0.118
208	UNNAMED CR	4957/12625	3	1.8	30	170	0.74	400	2,337	9	65%	2.3	0.90	2.0	0.107
209	UNNAMED CR	4957/12651	3	0.43	122	700	0.44	400	1,658	5	65%	2.3	0.90	2.0	0.076
210	UNNAMED CR	4939/12604	3	1.4	40	100	0.59	400	2,391	5	65%	2.3	0.90	2.0	0.109
211	UNNAMED CR	4948/12617	3	2	30	400	0.9	500	2,061	1.5	65%	2.8	0.90	2.6	0.075
212	UNNAMED CR	4952/12705	3	1.1	60	720	0.71	500	3,302	30	65%	2.8	0.90	2.6	0.121
213	UNNAMED CR	5008/12711	3	2.3	30	500	0.99	500	4,799	38	64%	2.8	0.90	2.5	0.179
214	UNNAMED CR	5004/12611	3	0.8	90	1200	0.65	600	4,355	12	64%	3.4	0.90	3.0	0.135
215	UNNAMED CR	5011/12524	3	0.8	100	1400	0.65	600	4,145	9	67%	3.5	0.90	3.2	0.123
216	UNNAMED CR	5030/12654	3	1.4	60	500	0.73	700	2,032	1.6	68%	4.2	0.90	3.8	0.051
217	UNNAMED CR	4947/12644	3	1.5	60	1150	0.87	700	4,160	19	65%	4.0	0.90	3.6	0.109
218	UNNAMED CR	5018/12712	3	1	90	600	0.62	700	3,749	27	65%	4.0	0.90	3.6	0.098
219	UNNAMED CR	5029/12721	3	1.2	90	600	0.65	800	2,857	10	65%	4.6	0.90	4.1	0.065
220	UNNAMED CR	5005/12625	3	2	60	1250	0.99	900	3,051	0.8	64%	5.0	0.90	4.5	0.063
221	UNNAMED CR	5010/12618	3	1.4	90	800	0.74	1,000	3,126	14	64%	5.6	0.90	5.0	0.058
222	UNNAMED CR	5008/12637	3	2.2	60	675	0.91	1,000	3,483	11	65%	5.7	0.90	5.1	0.064
223	UNNAMED CR	5020/12626	3	1.1	120	1000	0.67	1,000	5,929	23	64%	5.6	0.90	5.0	0.110
224	UNNAMED CR	5005/12628	3	1.5	90	1320	0.83	1,100	3,038	1.2	64%	6.2	0.90	5.6	0.051
225	UNNAMED CR	4929/12614	3	1.7	80	400	0.72	1,100	3,829	30	65%	6.3	0.90	5.6	0.064
226	UNNAMED CR	5021/12607	3	1.2	120	1000	0.68	1,100	3,301	19	64%	6.2	0.90	5.6	0.056
227	UNNAMED CR	5010/12620	3	0.74	244	1450	0.54	1,400	3,970	13	64%	7.8	0.90	7.1	0.053
228	UNNAMED CR	5010/12637	3	2	90	1200	0.92	1,400	4,039	7	65%	8.0	0.90	7.2	0.053
229	UNNAMED CR	5029/12624	3	1.3	152	1250	0.7	1,500	6,396	33	64%	8.4	0.90	7.6	0.079
230	UNNAMED CR	5007/12636	3	1.7	120	1000	0.78	1,600	5,251	9	65%	9.1	0.90	8.2	0.060
231	UNNAMED CR	5029/12222	3	1.2	180	1850	0.71	1,700	4,836	8	65%	9.7	0.90	8.7	0.052
232	UPANA CR	4948/12605	3	5.8	30	800	1.5	1,400	4,587	0.1	65%	8.0	0.90	7.2	0.060
233	UTLUH CR	5019/12725	3	1.5	60	920	0.84	700	4,740	10	65%	4.0	0.90	3.6	0.124
234	WADY CR	5024/12717	3	1.2	180	825	0.61	1,700	4,718	16	65%	9.7	0.90	8.7	0.051

TABLE 4.1 Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
235	WALT LAKE CR	4953/12408	3	0.7	150	600	0.49	800	2,553	16	65%	4.6	0.90	4.1	0.058
236	WARD CR	4947/12604	3	0.86	30	200	0.58	200	1,122	0.4	65%	1.1	0.90	1.0	0.103
237	WILFRED CR	4928/12451	3	1.5	50	313	0.71	600	1,670	3.5	62%	3.3	0.90	2.9	0.053
238	WILSON CR	4939/12610	3	1.4	40	400	0.76	400	2,380	11	65%	2.3	0.90	2.0	0.109
239	YOOKWA CR	5004/12628	3	2.5	30	800	1.1	600	3,274	3	64%	3.4	0.90	3.0	0.102
240	ADOLPH CR #2	5231/11924	4	2.7	61	700	1	1,300	5,588	29	50%	5.7	0.90	5.1	0.102
241	AZURE R #1	5235/11948	4	3.4	61	800	1.1	1,600	12,326	60	50%	7.0	0.90	6.3	0.183
242	AZURE R #2	5232/11947	4	8	30	900	1.8	1,900	14,497	60	50%	8.3	0.90	7.5	0.182
243	CAMP CR	5239/11911	4	2.6	91	1100	0.98	1,900	4,078	2	50%	8.3	0.90	7.5	0.051
244	CHUA CHUA CR	5121/12007	4	0.5	450	1900	0.44	1,800	3,246	2	43%	6.8	0.90	6.1	0.050
245	CIRQUE CR	5126/11706	4	0.4	123	700	0.44	400	2,181	2	52%	1.8	0.90	1.6	0.125
246	DAVE HENRY CR #1	5246/11904	4	3.2	61	850	1.1	1,500	4,627	15	50%	6.6	0.90	5.9	0.073
247	HOLT CR	5120/11710	4	0.8	92	1500	0.68	600	3,121	3	52%	2.7	0.90	2.5	0.119
248	KIMMEL CR	5243/11925	4	1.7	91	820	0.79	1,200	5,018	10	50%	5.3	0.90	4.7	0.100
249	MCLENNAN R	5250/11920	4	4.9	30	800	1.4	1,200	4,829	4	50%	5.3	0.90	4.7	0.096
250	MCLENNAN R @ N.ARM	5251/11921	4	3.3	61	1250	1.2	1,600	5,531	5.5	50%	7.0	0.90	6.3	0.082
251	OLDMAN CR	5129/11715	4	0.5	123	750	0.46	500	2,626	5	52%	2.3	0.90	2.0	0.120
252	PACKSADDLE CR	5248/11908	4	1.6	122	1250	0.8	1,500	4,254	7.5	50%	6.6	0.90	5.9	0.068
253	PETERSON CR	5112/12010	4	0.3	100	300	0.36	200	1,118	3	43%	0.8	0.90	0.7	0.155
254	SKULL CR	5109/12013	4	0.18	100	250	0.3	100	1,260	7	43%	0.4	0.90	0.3	0.349
255	SWIFT CR #2	5251/11916	4	3.7	61	1425	1.3	1,800	5,154	0.9	50%	7.9	0.90	7.1	0.068
256	YELLOWJACKET CR	5243/11903	4	3.3	61	400	0.96	1,600	3,671	17	50%	7.0	0.90	6.3	0.055
257	CHESHI CR	5128/12422	5	0.8	92	450	0.54	600	3,283	22	45%	2.4	0.90	2.1	0.145
258	DESERTERS CR	5249/12232	5	0.5	100	220	0.41	400	1,434	2	37%	1.3	0.90	1.2	0.115
259	JAMISON CR	5132/12426	5	0.4	396	3400	0.47	1,200	7,231	15	45%	4.7	0.90	4.3	0.159
260	KLINAKLINI CR	5152/12456	5	2.5	61	650	0.94	1,200	5,593	11	45%	4.7	0.90	4.3	0.123
261	LINCOLN CR	5141/12424	5	0.1	213	1500	0.31	200	1,381	2	45%	0.8	0.90	0.7	0.183
262	MACKIN CR	5222/12223	5	0.5	250	2000	0.49	1,000	2,571	2	45%	3.9	0.90	3.5	0.068
263	MAYDOE CR	5208/12516	5	0.7	213	3250	0.62	1,200	8,909	35	60%	6.3	0.90	5.7	0.147
264	MCCLINCHY CR	5207/12510	5	3.1	30	800	1.2	700	6,604	33	60%	3.7	0.90	3.3	0.187
265	MCLEESE CR	5220/12217	5	0.3	150	1300	0.45	400	1,424	0	45%	1.6	0.90	1.4	0.094
266	RELIANCE CR	5123/12441	5	1.7	92	350	0.68	1,200	7,525	50	50%	5.3	0.90	4.7	0.149
267	STIKELAN CR #1	5128/12424	5	4.8	31	450	1.3	1,200	4,816	22	45%	4.7	0.90	4.3	0.106
268	UNNAMED CR	5155/12444	5	0.5	61	750	0.53	200	1,487	1	40%	0.7	0.90	0.6	0.221
269	UNNAMED CR	5144/12427	5	0.4	425	3700	0.47	1,300	4,129	1	45%	5.1	0.90	4.6	0.084
270	VALLEAU CR	5144/12443	5	1.2	92	1050	0.73	900	3,556	25	45%	3.5	0.90	3.2	0.105
271	YOUNG CR @ RAPIDS	5232/12554	5	1.2	61	900	0.78	600	4,201	20	60%	3.2	0.90	2.8	0.139
272	CHRISTENSON CR	5228/12641	6	2.8	91	1400	1.1	2,000	8,431	12	65%	11.4	0.90	10.2	0.077
273	NIEUMIAMUS CR	5225/12651	6	2.5	61	1450	1.1	1,200	5,466	10	65%	6.8	0.90	6.1	0.083

TABLE 4.1 Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
274	NOOMST CR #2	5226/12613	6	3.4	61	550	1	1,600	3,712	1	65%	9.1	0.90	8.2	0.042
275	NOOSGULCH CR	5226/12623	6	8.4	30	700	1.7	2,000	5,904	1	65%	11.4	0.90	10.2	0.054
276	TASTSQUAN CR	5222/12645	6	1.9	91	250	0.67	1,400	2,240	0.5	65%	8.0	0.90	7.2	0.029
277	TSINI-TSINI CR	5222/12606	6	1.2	213	1450	0.66	2,000	4,837	12	65%	11.4	0.90	10.2	0.044
278	BOUNDING CR	5328/12039	7	0.5	92	800	0.52	400	3,686	37	50%	1.8	0.90	1.6	0.219
279	CLYDE CR #1	5323/12022	7	1.1	183	2250	0.7	1,600	4,917	15	50%	7.0	0.90	6.3	0.073
280	CLYDE CR #2	5323/12022	7	1.1	91	900	0.68	800	3,134	16	50%	3.5	0.90	3.2	0.093
281	EAST TWIN CR	5328/12023	7	3.9	61	300	0.98	1,900	4,444	22	50%	8.3	0.90	7.5	0.056
282	EDDY CR	5314/12007	7	0.7	213	1000	0.51	1,200	3,178	10	50%	5.3	0.90	4.7	0.063
283	FLEET CR	5330/12027	7	2	91	1500	0.95	1,400	5,044	32	50%	6.1	0.90	5.5	0.086
284	HOLLIDAY CR	5311/11953	7	1.8	91	1400	0.9	1,300	4,971	28	50%	5.7	0.90	5.1	0.091
285	LEGRAND	5325/12023	7	0.5	152	1150	0.49	600	2,947	22	50%	2.6	0.90	2.4	0.117
286	MCINTOSH CR	5321/12020	7	1.2	92	800	0.69	900	2,899	12	50%	3.9	0.90	3.5	0.077
287	MCKALE R	5327/12012	7	1.1	183	1600	0.66	1,600	6,633	25	50%	7.0	0.90	6.3	0.099
288	ALICE CR	5440/12847	8	1.9	92	1200	0.89	1,400	3,388	1	60%	7.4	0.90	6.6	0.048
289	ANDERSON CR	5402/12843	8	2.6	61	900	1	1,200	3,357	5	60%	6.3	0.90	5.7	0.056
290	BOWBYES CR	5409/12842	8	1.4	122	800	0.7	1,300	3,397	8	60%	6.8	0.90	6.1	0.052
291	BUCK CR	5420/12637	8	3.7	50	900	1.2	1,400	4,103	2.3	50%	6.1	0.90	5.5	0.070
292	CHIST CR #1	5419/12824	8	3.4	31	700	1.2	800	6,111	13	60%	4.2	0.90	3.8	0.152
293	CHIST CR #2	5419/12818	8	2.7	61	975	1	1,300	7,409	16	60%	6.8	0.90	6.1	0.113
294	COLDWATER CR	5420/12840	8	2.8	91	1825	1.1	2,000	7,170	7.5	60%	10.5	0.90	9.5	0.071
295	DAHL CR	5409/12843	8	2.4	91	600	0.86	1,700	3,637	10	60%	8.9	0.90	8.0	0.042
296	DASQUE CR	5423/12855	8	3.7	61	920	1.2	1,800	7,071	16	60%	9.5	0.90	8.5	0.078
297	ERLANDSEN CR	5436/12844	8	4	61	1500	1.3	1,900	5,567	9	60%	10.0	0.90	9.0	0.058
298	GOAT CR	5443/12846	8	1.7	91	675	0.77	1,200	2,599	4	60%	6.3	0.90	5.7	0.043
299	HANKIN CR	5435/12826	8	1	91	950	0.67	700	3,406	1	60%	3.7	0.90	3.3	0.097
300	HARDSCRABBLE CR	5442/12820	8	2.9	61	350	0.9	1,400	4,304	8	60%	7.4	0.90	6.6	0.061
301	HOWSON CR	5433/12721	8	2	50	700	0.91	800	5,159	28	50%	3.5	0.90	3.2	0.154
302	HUMPHRYS CR	5411/12830	8	1.4	122	1900	0.82	1,300	4,453	13	60%	6.8	0.90	6.1	0.068
303	MOLYBDENUM CR	5434/12845	8	1	152	1100	0.63	1,200	2,846	8.5	60%	6.3	0.90	5.7	0.047
304	NABEELAH CR	5408/12832	8	1.4	92	900	0.75	1,000	2,807	6	60%	5.3	0.90	4.7	0.056
305	PINKUT CR FALLS #1	5427/12527	8	6	31	400	N/A	1,500	5,351	30	43%	5.7	0.90	5.1	0.099
306	RALEY CR	5412/12842	8	1.5	91	1250	0.82	1,100	4,109	15	60%	5.8	0.90	5.2	0.074
307	SHANNON CR	5440/12730	8	1.5	122	1200	0.77	1,400	4,729	17	60%	7.4	0.90	6.6	0.067
308	SINCLAIR CR	5437/12730	8	0.7	100	1500	0.62	500	2,819	17	50%	2.2	0.90	2.0	0.134
309	STE CROIX	5442/12819	8	1.7	122	1400	0.83	1,600	3,766	6	60%	8.4	0.90	7.6	0.047
310	TROUT CR	5451/12719	8	1.6	50	500	0.79	600	1,753	0	60%	3.2	0.90	2.8	0.058
311	UNNAMED CR	5405/12830	8	1	61	950	0.73	500	2,635	5	60%	2.6	0.90	2.4	0.105
312	UNNAMED CR	5415/12846	8	0.7	122	800	0.54	700	3,900	21	60%	3.7	0.90	3.3	0.111

TABLE 4.1 Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
313	UNNAMED CR	5419/12824	8	1.2	91	850	0.7	900	4,085	10	60%	4.7	0.90	4.3	0.090
314	UNNAMED CR	5405/12820	8	2.6	91	900	0.95	1,900	7,552	22	60%	10.0	0.90	9.0	0.079
315	UNNAMED CR	5423/12853	8	1.4	183	1250	0.7	2,000	6,219	15	60%	10.5	0.90	9.5	0.062
316	WHITE CR	5424/12841	8	1.3	152	1750	0.75	1,500	4,996	8	60%	7.9	0.90	7.1	0.066
317	AYTON CR	5411/12943	9	4.5	31	400	1.2	1,100	4,189	6	70%	6.7	0.90	6.1	0.065
318	COLONEL JOHNSON CR	5413/13009	9	0.3	276	800	0.36	600	1,765	5	70%	3.7	0.90	3.3	0.050
319	HAANS CR SANDSPIT	5313/13153	9	1.5	62	1900	0.95	700	4,645	4	65%	4.0	0.90	3.6	0.122
320	MARION CR	5422/13003	9	1	122	1600	0.7	1,000	4,243	20	70%	6.1	0.90	5.5	0.072
321	SACHS CR	5312/13158	9	1.2	91	850	0.7	900	2,419	5	65%	5.1	0.90	4.6	0.049
322	TALA HAAT CR	5446/13004	9	3.1	30	300	1	700	3,523	5	65%	4.0	0.90	3.6	0.092
323	TLELL R	5322/13200	9	2.2	30	600	1	500	5,598	14	65%	2.8	0.90	2.6	0.205
324	UNNAMED CR	5308/13153	9	1.3	30	600	0.84	300	2,961	11	70%	1.8	0.90	1.7	0.168
325	UNNAMED CR	5410/12956	9	0.1	650	2000	0.23	500	2,342	0.5	70%	3.1	0.90	2.8	0.080
326	UNNAMED CR	5405/12956	9	3.8	30	400	1.2	900	4,215	12	70%	5.5	0.90	5.0	0.080
327	UNNAMED CR	5427/13004	9	0.6	274	1100	0.47	1,300	4,321	30	70%	8.0	0.90	7.2	0.057
328	UNNAMED CR	5406/12955	9	5.6	31	600	1.4	1,400	5,454	12	70%	8.6	0.90	7.7	0.066
329	UNNAMED CR	5411/12945	9	1.5	122	1300	0.78	1,400	4,182	10	70%	8.6	0.90	7.7	0.051
330	BARNEY GULCH	5557/12958	11	0.5	457	2000	0.45	1,800	3,597	2	55%	8.7	0.90	7.8	0.043
331	BEAR R	5607/12946	11	5.1	30	450	1.3	1,200	5,000	28	55%	5.8	0.90	5.2	0.090
332	BLACKSTOCK CR	5540/12745	11	0.8	92	550	0.56	600	2,754	20	50%	2.6	0.90	2.4	0.109
333	CARRIGAN CR	5538/12745	11	0.72	91	650	0.55	500	2,576	16	50%	2.2	0.90	2.0	0.123
334	CASCADE R	5603/13002	11	4.1	61	350	1	2,000	4,430	17	55%	9.6	0.90	8.7	0.048
335	CAUSQUA CR	5502/12716	11	1	91	550	0.62	700	2,279	4.5	50%	3.1	0.90	2.8	0.078
336	GLACIER CR	5559/12956	11	2.9	61	600	0.99	1,400	3,895	7	55%	6.7	0.90	6.1	0.060
337	INSECT CR	5503/12829	11	1.3	152	2550	0.81	1,500	8,257	13	60%	7.9	0.90	7.1	0.109
338	JUNIPER CR	5507/12742	11	1.2	91	1550	0.79	900	4,777	8	60%	4.7	0.90	4.3	0.105
339	LUND CR	5510/12720	11	0.54	153	1000	0.49	600	3,172	16	50%	2.6	0.90	2.4	0.126
340	MILL CR	5506/12807	11	3.4	61	1125	1.2	1,600	4,307	3	60%	8.4	0.90	7.6	0.053
341	UNNAMED CR	5526/12846	11	0.9	152	1050	0.59	1,100	4,179	16	50%	4.8	0.90	4.3	0.090
342	UNNAMED CR	5503/12807	11	2.6	61	950	1	1,200	4,291	3.3	60%	6.3	0.90	5.7	0.071
343	UTSUN CR	5527/12735	11	0.74	122	1450	0.61	700	2,906	5	50%	3.1	0.90	2.8	0.099
344	WILSON CR	5503/12817	11	1.1	122	1525	0.71	1,100	3,214	5	60%	5.8	0.90	5.2	0.058
345	CLASSY CR	5801/13047	13	0.84	152	900	0.57	1,000	4,188	17	45%	3.9	0.90	3.5	0.111
346	DODJATIN CR	5753/13118	13	0.78	122	750	0.55	700	2,846	12	45%	2.8	0.90	2.5	0.108
347	EIGHT MILE CR	5758/13105	13	0.27	91	150	0.31	200	1,813	10	45%	0.8	0.90	0.7	0.240
348	FOURTH OF JULY CR	5940/13339	13	1.8	92	1600	0.92	1,300	4,578	8	30%	3.4	0.90	3.1	0.140
349	HARTZ CR	5803/13100	13	0.33	213	1600	0.45	600	2,933	9	45%	2.4	0.90	2.1	0.129
350	HITCHCOCK CR	5955/13348	13	1.8	62	1025	0.9	900	4,639	40	30%	2.4	0.90	2.1	0.205
351	MEEHAUS CR	5805/13043	13	0.97	92	670	0.62	700	4,044	20	45%	2.8	0.90	2.5	0.153

TABLE 4.1 Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
352	NINE MILE CR	5759/13102	13	0.2	213	950	0.36	300	1,667	13	45%	1.2	0.90	1.1	0.147
353	TELEGRAPH CR	5754/13110	13	0.56	152	1200	0.51	700	2,048	0	45%	2.8	0.90	2.5	0.077

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
1	TASTSQUAN CR	5222/12645	6	1.9	91	250	0.67	1,400	2,240	0.5	65%	8.0	0.90	7.2	0.029
2	UNNAMED CR	4944/12332	2	0.44	397	700	0.41	1,400	2,082	5	55%	6.7	0.90	6.1	0.032
3	MCKELVIE CR	4956/12639	3	2.4	90	600	0.86	1,700	3,011	4	65%	9.7	0.90	8.7	0.032
4	FALL CR	5036/11853	1	0.45	500	1000	0.41	1,800	2,347	1.5	45%	7.1	0.90	6.4	0.034
5	CYPRESS CR	4920/12314	2	1.3	105	825	0.7	1,100	1,782	0	55%	5.3	0.90	4.8	0.035
6	VICTOR CR	5057/11824	1	0.5	300	550	0.4	1,200	1,607	6	45%	4.7	0.90	4.3	0.035
7	UNNAMED CR	5058/11836	1	0.5	300	700	0.4	1,200	1,721	7	45%	4.7	0.90	4.3	0.038
8	BREMNER CR	4940/12201	2	3.1	60	200	0.83	1,500	2,747	7	55%	7.2	0.90	6.5	0.040
9	MARA CR	5046/11900	2	0.46	250	1000	0.44	900	1,389	1	45%	3.5	0.90	3.2	0.041
10	ANDERSON CR	4911/12143	2	0.21	850	1500	0.31	1,400	3,035	5	63%	7.7	0.90	7.0	0.041
11	LOFTUS CR	5056/11849	1	0.75	250	1000	0.51	1,500	2,378	0.5	45%	5.9	0.90	5.3	0.042
12	TRUAX CR	5053/12238	2	1	200	700	0.55	1,600	2,936	18	52%	7.3	0.90	6.6	0.042
13	BLURTON CR	5041/11902	2	0.48	400	1600	0.44	1,500	2,383	1	45%	5.9	0.90	5.3	0.042
14	UNNAMED CR	4941/12316	2	0.41	580	1700	0.41	1,900	3,717	2.5	55%	9.2	0.90	8.2	0.042
15	DAHL CR	5409/12843	8	2.4	91	600	0.86	1,700	3,637	10	60%	8.9	0.90	8.0	0.042
16	NOOMST CR #2	5226/12613	6	3.4	61	550	1	1,600	3,712	1	65%	9.1	0.90	8.2	0.042
17	EATON CR	4915/12123	2	0.3	850	2150	0.36	2,000	4,525	16	63%	11.0	0.90	9.9	0.043
18	UNNAMED CR	5055/11807	1	0.85	250	1150	0.54	1,700	2,755	1	45%	6.7	0.90	6.0	0.043
19	GOAT CR	5443/12846	8	1.7	91	675	0.77	1,200	2,599	4	60%	6.3	0.90	5.7	0.043
20	BARNEY GULCH	5557/12958	11	0.5	457	2000	0.45	1,800	3,597	2	55%	8.7	0.90	7.8	0.043
21	TSINI-TSINI CR	5222/12606	6	1.2	213	1450	0.66	2,000	4,837	12	65%	11.4	0.90	10.2	0.044
22	DRUMMIE CR	5052/11805	1	1.3	150	700	0.63	1,500	2,549	7	45%	5.9	0.90	5.3	0.045
23	TLOOLS CR	4952/12545	3	3	50	625	1.1	1,200	2,971	1	65%	6.8	0.90	6.1	0.045
24	KAIN CR	5051/11635	1	0.95	250	1100	0.56	1,900	3,792	16	52%	8.7	0.90	7.8	0.046
25	LOST LEDGE CR	5006/11656	1	0.28	430	1700	0.36	900	1,639	0.5	47%	3.7	0.90	3.3	0.046
26	WRAY CR	4920/12118	2	0.83	305	2000	0.57	2,000	4,670	12	60%	10.5	0.90	9.5	0.046
27	LADYBIRD CR	4925/11740	1	2	120	600	0.76	1,900	2,959	2.5	40%	6.7	0.90	6.0	0.046
28	STE CROIX	5442/12819	8	1.7	122	1400	0.83	1,600	3,766	6	60%	8.4	0.90	7.6	0.047
29	MOLYBDENUM CR	5434/12845	8	1	152	1100	0.63	1,200	2,846	8.5	60%	6.3	0.90	5.7	0.047
30	NEWCASTLE CR	5022/12607	3	2	90	850	0.85	1,400	3,600	15	64%	7.8	0.90	7.1	0.048
31	CASCADE R	5603/13002	11	4.1	61	350	1	2,000	4,430	17	55%	9.6	0.90	8.7	0.048
32	ALICE CR	5440/12847	8	1.9	92	1200	0.89	1,400	3,388	1	60%	7.4	0.90	6.6	0.048
33	LEINER R	4956/12637	3	8.1	30	350	1.5	1,900	4,986	4	65%	10.8	0.90	9.7	0.048
34	HUMMING BIRD CR	5046/11900	2	0.3	250	750	0.36	600	1,103	1	45%	2.4	0.90	2.1	0.049
35	UNNAMED CR	4941/12335	2	0.18	793	1800	0.31	1,100	2,585	0	57%	5.5	0.90	4.9	0.049
36	SACHS CR	5312/13158	9	1.2	91	850	0.7	900	2,419	5	65%	5.1	0.90	4.6	0.049
37	MAIMEN CR	4917/12124	2	0.39	610	3150	0.44	1,900	4,762	11	60%	10.0	0.90	9.0	0.050
38	UNNAMED CR	4929/12125	2	0.45	425	2600	0.45	1,500	3,769	3	60%	7.9	0.90	7.1	0.050
39	CHUA CHUA CR	5121/12007	4	0.5	450	1900	0.44	1,800	3,246	2	43%	6.8	0.90	6.1	0.050

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
40	DAVIS CR	5008/11657	1	0.8	122	500	0.52	800	1,578	0.5	47%	3.3	0.90	3.0	0.050
41	COLONEL JOHNSON CR	5413/13009	9	0.3	276	800	0.36	600	1,765	5	70%	3.7	0.90	3.3	0.050
42	WHITECAP CR	5043/12218	2	0.73	200	950	0.52	1,100	2,415	1	52%	5.0	0.90	4.5	0.050
43	UNNAMED CR	5411/12945	9	1.5	122	1300	0.78	1,400	4,182	10	70%	8.6	0.90	7.7	0.051
44	UNNAMED CR	5030/12654	3	1.4	60	500	0.73	700	2,032	1.6	68%	4.2	0.90	3.8	0.051
45	WADY CR	5024/12717	3	1.2	180	825	0.61	1,700	4,718	16	65%	9.7	0.90	8.7	0.051
46	TRETHEWAY CR	4942/12205	2	7.5	30	150	1.3	1,800	4,228	0	55%	8.7	0.90	7.8	0.051
47	HEADQUARTERS CR	4942/12507	3	1.5	50	250	0.68	600	1,668	1.4	65%	3.4	0.90	3.1	0.051
48	MEMEKAY R	5010/12547	3	4.1	50	1000	1.3	1,600	4,591	7.5	67%	9.4	0.90	8.5	0.051
49	CAMP CR	5239/11911	4	2.6	91	1100	0.98	1,900	4,078	2	50%	8.3	0.90	7.5	0.051
50	CRAFT CR	5024/12715	3	1.2	180	1800	0.71	1,700	4,764	18	65%	9.7	0.90	8.7	0.051
51	UNNAMED CR	5005/12628	3	1.5	90	1320	0.83	1,100	3,038	1.2	64%	6.2	0.90	5.6	0.051
52	CADWALLADER CR	5046/12248	2	4.8	50	600	1.2	1,900	4,284	0.5	52%	8.7	0.90	7.8	0.052
53	BOWBYES CR	5409/12842	8	1.4	122	800	0.7	1,300	3,397	8	60%	6.8	0.90	6.1	0.052
54	UNNAMED CR	5029/12222	3	1.2	180	1850	0.71	1,700	4,836	8	65%	9.7	0.90	8.7	0.052
55	CHASE CR	5049/11941	2	0.99	100	500	0.58	800	1,591	0	45%	3.2	0.90	2.8	0.053
56	UNNAMED CR	5010/12620	3	0.74	244	1450	0.54	1,400	3,970	13	64%	7.8	0.90	7.1	0.053
57	UNNAMED CR	5010/12637	3	2	90	1200	0.92	1,400	4,039	7	65%	8.0	0.90	7.2	0.053
58	BIG TREE	5015/12545	3	1.7	100	1900	0.92	1,300	3,889	1.5	67%	7.6	0.90	6.9	0.053
59	MILL CR	5506/12807	11	3.4	61	1125	1.2	1,600	4,307	3	60%	8.4	0.90	7.6	0.053
60	WILFRED CR	4928/12451	3	1.5	50	313	0.71	600	1,670	3.5	62%	3.3	0.90	2.9	0.053
61	POST CR	4905/12128	2	1.1	125	500	0.59	1,100	2,971	17	60%	5.8	0.90	5.2	0.054
62	NOOSGULCH CR	5226/12623	6	8.4	30	700	1.7	2,000	5,904	1	65%	11.4	0.90	10.2	0.054
63	UNNAMED CR	4940/12335	2	0.15	1037	2400	0.25	1,200	3,276	0	60%	6.3	0.90	5.7	0.054
64	MACKTUSH CR	4906/12451	3	2.9	50	625	1	1,100	3,104	10	62%	6.0	0.90	5.4	0.054
65	UNNAMED CR	4909/12115	2	0.9	245	1500	0.59	1,700	4,885	30	63%	9.4	0.90	8.4	0.054
66	SMYTH CR	5032/11843	1	0.29	600	2000	0.36	1,400	2,874	15	45%	5.5	0.90	5.0	0.054
67	YELLOWJACKET CR	5243/11903	4	3.3	61	400	0.96	1,600	3,671	17	50%	7.0	0.90	6.3	0.055
68	BEECH CR	4936/12512	3	1.3	50	125	0.57	500	1,494	8.2	65%	2.8	0.90	2.6	0.055
69	SWAH CR	5001/12620	3	1.4	60	700	0.78	700	2,113	1.9	65%	4.0	0.90	3.6	0.055
70	ANDERSON CR	5402/12843	8	2.6	61	900	1	1,200	3,357	5	60%	6.3	0.90	5.7	0.056
71	EAST TWIN CR	5328/12023	7	3.9	61	300	0.98	1,900	4,444	22	50%	8.3	0.90	7.5	0.056
72	NABEELAH CR	5408/12832	8	1.4	92	900	0.75	1,000	2,807	6	60%	5.3	0.90	4.7	0.056
73	UNNAMED CR	5021/12607	3	1.2	120	1000	0.68	1,100	3,301	19	64%	6.2	0.90	5.6	0.056
74	KINMAN CR	5021/12655	3	1.5	90	1050	0.8	1,100	3,549	21	68%	6.6	0.90	5.9	0.056
75	UNNAMED CR	5427/13004	9	0.6	274	1100	0.47	1,300	4,321	30	70%	8.0	0.90	7.2	0.057
76	NORA CR	5008/12602	3	1.1	152	1200	0.67	1,300	3,981	22	64%	7.3	0.90	6.6	0.057
77	UNNAMED CR	4912/12120	2	0.26	670	2050	0.36	1,400	4,230	24	63%	7.7	0.90	7.0	0.057
78	HILLS CR	5043/11904	2	0.68	250	1250	0.51	1,300	2,831	3	45%	5.1	0.90	4.6	0.058

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
79	COMOX CR	4932/12515	3	2	50	125	0.67	800	2,525	18	65%	4.6	0.90	4.1	0.058
80	CHEEKYE R	4948/12306	2	1.7	120	1200	0.81	1,600	4,279	7	55%	7.7	0.90	6.9	0.058
81	TROUT CR	5451/12719	8	1.6	50	500	0.79	600	1,753	0	60%	3.2	0.90	2.8	0.058
82	WILSON CR	5503/12817	11	1.1	122	1525	0.71	1,100	3,214	5	60%	5.8	0.90	5.2	0.058
83	ERLANDSEN CR	5436/12844	8	4	61	1500	1.3	1,900	5,567	9	60%	10.0	0.90	9.0	0.058
84	UNNAMED CR	5010/12618	3	1.4	90	800	0.74	1,000	3,126	14	64%	5.6	0.90	5.0	0.058
85	ATLUCK CR	5018/12656	3	8.6	30	700	1.7	2,000	6,362	16	65%	11.4	0.90	10.2	0.058
86	NOEL CR	5046/12248	2	3.2	50	400	0.99	1,300	3,310	2	52%	5.9	0.90	5.3	0.058
87	WALT LAKE CR	4953/12408	3	0.7	150	600	0.49	800	2,553	16	65%	4.6	0.90	4.1	0.058
88	UNNAMED CR	5021/11651	1	0.32	430	2000	0.41	1,100	2,971	15	55%	5.3	0.90	4.8	0.058
89	SCHROEDER CR	5002/11653	1	0.64	300	2300	0.53	1,500	3,502	0.5	47%	6.2	0.90	5.6	0.059
90	DICK BOOTH CR	5041/12731	3	1.3	90	1500	0.82	900	3,054	2.5	68%	5.4	0.90	4.8	0.059
91	LAFORGUE CR	4914/12109	2	0.62	300	1200	0.47	1,500	4,498	27	60%	7.9	0.90	7.1	0.059
92	UPANA CR	4948/12605	3	5.8	30	800	1.5	1,400	4,587	0.1	65%	8.0	0.90	7.2	0.060
93	UNNAMED CR	4915/12115	2	0.93	180	1300	0.61	1,300	3,935	25	60%	6.8	0.90	6.1	0.060
94	UNNAMED CR	5007/12636	3	1.7	120	1000	0.78	1,600	5,251	9	65%	9.1	0.90	8.2	0.060
95	GLACIER CR	5559/12956	11	2.9	61	600	0.99	1,400	3,895	7	55%	6.7	0.90	6.1	0.060
96	PERRY R	4954/12637	3	5.2	30	600	1.4	1,200	3,963	3	65%	6.8	0.90	6.1	0.060
97	HARDSCRABBLE CR	5442/12820	8	2.9	61	350	0.9	1,400	4,304	8	60%	7.4	0.90	6.6	0.061
98	ADRIAN CR	4948/12527	3	1.8	50	625	0.87	700	2,352	0	65%	4.0	0.90	3.6	0.062
99	UNNAMED CR	5423/12853	8	1.4	183	1250	0.7	2,000	6,219	15	60%	10.5	0.90	9.5	0.062
100	JOHN CR	5016/11701	1	0.62	180	1200	0.51	900	2,207	4.5	47%	3.7	0.90	3.3	0.062
101	UNNAMED CR	5006/11646	1	0.18	550	1650	0.31	800	2,095	8	50%	3.5	0.90	3.2	0.062
102	SEPTET CR	5048/11641	1	1.4	150	950	0.69	1,600	4,365	34	52%	7.3	0.90	6.6	0.062
103	REINECKER CR	5047/11913	2	0.96	100	500	0.58	800	1,903	4	45%	3.2	0.90	2.8	0.063
104	EDDY CR	5314/12007	7	0.7	213	1000	0.51	1,200	3,178	10	50%	5.3	0.90	4.7	0.063
105	UNNAMED CR	5005/12625	3	2	60	1250	0.99	900	3,051	0.8	64%	5.0	0.90	4.5	0.063
106	FLEET CR	4835/12403	3	5	50	750	1.3	2,000	5,429	24	51%	8.9	0.90	8.0	0.063
107	PAYNE CR	5037/11751	1	1.6	100	400	0.67	1,300	3,676	45	53%	6.0	0.90	5.4	0.064
108	PALMERSTON ST	5027/12616	3	1.7	90	725	0.79	1,200	4,106	28	64%	6.7	0.90	6.1	0.064
109	TRENT R	4935/12459	3	2	50	880	0.95	800	2,781	4	65%	4.6	0.90	4.1	0.064
110	BRODRICK CR	4950/12653	3	1.4	120	1650	0.79	1,300	4,520	21	65%	7.4	0.90	6.7	0.064
111	UNNAMED CR	4929/12614	3	1.7	80	400	0.72	1,100	3,829	30	65%	6.3	0.90	5.6	0.064
112	UNNAMED CR	5008/12637	3	2.2	60	675	0.91	1,000	3,483	11	65%	5.7	0.90	5.1	0.064
113	TEMPLETON CR	5048/11629	1	1	250	1700	0.62	2,000	5,615	21	52%	9.1	0.90	8.2	0.064
114	AYTON CR	5411/12943	9	4.5	31	400	1.2	1,100	4,189	6	70%	6.7	0.90	6.1	0.065
115	SWANEE CR	4915/12123	2	0.23	460	1900	0.36	800	2,616	17	60%	4.2	0.90	3.8	0.065
116	PRETTY GIRL L	4930/12614	3	1.7	80	400	0.72	1,100	3,910	32	65%	6.3	0.90	5.6	0.065
117	TOWN CR	5046/11745	1	0.49	400	1400	0.44	1,500	4,364	44	53%	7.0	0.90	6.3	0.065

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
118	MOWHOKAM CR	5002/12131	2	1.4	100	1000	0.76	1,100	3,021	3	50%	4.8	0.90	4.3	0.065
119	UNNAMED CR	5029/12721	3	1.2	90	600	0.65	800	2,857	10	65%	4.6	0.90	4.1	0.065
120	CORN CR	4904/11640	1	2.3	60	800	0.96	1,100	3,326	4	55%	5.3	0.90	4.8	0.065
121	TEXAS CR	5031/12150	2	2.3	100	800	0.87	1,800	4,963	23	50%	7.9	0.90	7.1	0.066
122	KAOUK R	5005/12652	3	3.6	60	1400	1.3	1,700	6,108	18	65%	9.7	0.90	8.7	0.066
123	WHITE CR	5424/12841	8	1.3	152	1750	0.75	1,500	4,996	8	60%	7.9	0.90	7.1	0.066
124	UNNAMED CR	5406/12955	9	5.6	31	600	1.4	1,400	5,454	12	70%	8.6	0.90	7.7	0.066
125	HOPE CR	5028/11711	1	0.76	240	1250	0.53	1,400	3,692	24	47%	5.8	0.90	5.2	0.067
126	NOR/MID MEMEKAY R	5011/12547	3	4.1	50	1250	1.3	1,600	6,022	5.5	67%	9.4	0.90	8.5	0.067
127	SHANNON CR	5440/12730	8	1.5	122	1200	0.77	1,400	4,729	17	60%	7.4	0.90	6.6	0.067
128	TAHSISH R	5013/12703	3	3	60	500	0.97	1,400	5,069	45	64%	7.8	0.90	7.1	0.067
129	PACKSADDLE CR	5248/11908	4	1.6	122	1250	0.8	1,500	4,254	7.5	50%	6.6	0.90	5.9	0.068
130	CLUXEWE R	5029/12709	3	1.8	60	550	0.82	800	2,951	11	65%	4.6	0.90	4.1	0.068
131	SHEPHERD CR	4938/12531	3	3.2	50	500	1	1,300	4,812	39	65%	7.4	0.90	6.7	0.068
132	HUMPHRYS CR	5411/12830	8	1.4	122	1900	0.82	1,300	4,453	13	60%	6.8	0.90	6.1	0.068
133	MACKIN CR	5222/12223	5	0.5	250	2000	0.49	1,000	2,571	2	45%	3.9	0.90	3.5	0.068
134	SWIFT CR #2	5251/11916	4	3.7	61	1425	1.3	1,800	5,154	0.9	50%	7.9	0.90	7.1	0.068
135	LEGERWOOD CR	5058/11846	1	0.53	250	1300	0.47	1,000	2,594	1.5	45%	3.9	0.90	3.5	0.069
136	BEDWELL R	4927/12536	3	3.1	50	500	1	1,200	4,313	32	62%	6.5	0.90	5.9	0.069
137	SLEWISKIN CR	5008/11747	1	3.4	60	1200	1.2	1,600	4,188	2	45%	6.3	0.90	5.7	0.069
138	UNNAMED CR	5007/11644	1	0.22	490	1400	0.3	800	2,336	13	50%	3.5	0.90	3.2	0.070
139	BUCK CR	5420/12637	8	3.7	50	900	1.2	1,400	4,103	2.3	50%	6.1	0.90	5.5	0.070
140	UNNAMED CR	5020/11651	1	0.28	300	1150	0.36	700	2,054	14	50%	3.1	0.90	2.8	0.070
141	DENNIS CR	5002/11722	1	0.71	182	1250	0.55	1,000	2,641	2	45%	3.9	0.90	3.5	0.070
142	SONGHEES CR	5047/12735	3	4.5	30	450	1.3	1,100	4,401	8	68%	6.6	0.90	5.9	0.070
143	MEADOW CR	5018/11703	1	0.62	180	1300	0.52	900	2,498	4	47%	3.7	0.90	3.3	0.070
144	KEARY CR	5049/12225	2	0.6	400	2800	0.52	1,900	5,839	12	52%	8.7	0.90	7.8	0.070
145	AHAMINGUS CR	4941/12607	3	0.99	40	100	0.52	300	1,155	0.5	65%	1.7	0.90	1.5	0.071
146	UNNAMED CR	5503/12807	11	2.6	61	950	1	1,200	4,291	3.3	60%	6.3	0.90	5.7	0.071
147	LEXINGTON CR	5050/11737	1	0.55	450	1700	0.45	1,900	6,005	58	53%	8.8	0.90	7.9	0.071
148	COLDWATER CR	5420/12840	8	2.8	91	1825	1.1	2,000	7,170	7.5	60%	10.5	0.90	9.5	0.071
149	MUCHALAT R	4935/12619	3	2	60	350	0.78	900	3,527	12	65%	5.1	0.90	4.6	0.072
150	MARION CR	5422/13003	9	1	122	1600	0.7	1,000	4,243	20	70%	6.1	0.90	5.5	0.072
151	FERRY CR	5015/11839	1	1.1	150	3100	0.78	1,300	4,060	1	51%	5.8	0.90	5.2	0.073
152	CLYDE CR #1	5323/12022	7	1.1	183	2250	0.7	1,600	4,917	15	50%	7.0	0.90	6.3	0.073
153	DAVE HENRY CR #1	5246/11904	4	3.2	61	850	1.1	1,500	4,627	15	50%	6.6	0.90	5.9	0.073
154	BOBB CR	5051/12233	2	0.8	300	1400	0.53	1,900	6,100	22	52%	8.7	0.90	7.8	0.074
155	BUTTERWORT/ELK CR	4948/15553	3	2.6	50	375	0.91	1,000	4,020	6.3	65%	5.7	0.90	5.1	0.074
156	RALEY CR	5412/12842	8	1.5	91	1250	0.82	1,100	4,109	15	60%	5.8	0.90	5.2	0.074

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
157	FOLEY CR	4908/12133	2	0.85	240	2800	0.64	1,600	5,977	14	60%	8.4	0.90	7.6	0.074
158	BANCROFT	4934/12552	3	2.2	100	560	0.8	1,700	6,940	26	65%	9.7	0.90	8.7	0.075
159	BURMAN R	4936/12550	3	4.4	50	250	1	1,700	6,950	26	65%	9.7	0.90	8.7	0.075
160	FRIEND CR	4958/12648	3	0.38	90	300	0.41	300	1,229	3	65%	1.7	0.90	1.5	0.075
161	HICKS CR	4911/12121	2	0.81	120	900	0.58	800	3,179	25	63%	4.4	0.90	4.0	0.075
162	UNNAMED CR	4948/12617	3	2	30	400	0.9	500	2,061	1.5	65%	2.8	0.90	2.6	0.075
163	UNNAMED CR	4957/12651	3	0.43	122	700	0.44	400	1,658	5	65%	2.3	0.90	2.0	0.076
164	DRINKWATER CR	4926/12530	3	3.3	50	250	0.92	1,300	5,156	23	62%	7.1	0.90	6.4	0.076
165	MCINTOSH CR	5321/12020	7	1.2	92	800	0.69	900	2,899	12	50%	3.9	0.90	3.5	0.077
166	HALL CR	5041/11706	1	1.8	100	850	0.8	1,400	4,784	51	53%	6.5	0.90	5.8	0.077
167	IRON CR	5043/11836	1	0.22	550	2000	0.36	900	2,736	22	47%	3.7	0.90	3.3	0.077
168	CHRISTENSON CR	5228/12641	6	2.8	91	1400	1.1	2,000	8,431	12	65%	11.4	0.90	10.2	0.077
169	TELEGRAPH CR	5754/13110	13	0.56	152	1200	0.51	700	2,048	0	45%	2.8	0.90	2.5	0.077
170	CAUSQUA CR	5502/12716	11	1	91	550	0.62	700	2,279	4.5	50%	3.1	0.90	2.8	0.078
171	DASQUE CR	5423/12855	8	3.7	61	920	1.2	1,800	7,071	16	60%	9.5	0.90	8.5	0.078
172	HUNTERS CR	5041/11847	1	1.3	150	1900	0.77	1,500	4,431	10	45%	5.9	0.90	5.3	0.078
173	UNNAMED CR	5405/12820	8	2.6	91	900	0.95	1,900	7,552	22	60%	10.0	0.90	9.0	0.079
174	KAUWINCH R	5014/12716	3	1.2	120	900	0.68	1,100	4,684	24	64%	6.2	0.90	5.6	0.079
175	UNNAMED CR	5029/12624	3	1.3	152	1250	0.7	1,500	6,396	33	64%	8.4	0.90	7.6	0.079
176	UNNAMED CR	5405/12956	9	3.8	30	400	1.2	900	4,215	12	70%	5.5	0.90	5.0	0.080
177	UNNAMED CR	5410/12956	9	0.1	650	2000	0.23	500	2,342	0.5	70%	3.1	0.90	2.8	0.080
178	PLACER CR	4911/12034	2	0.69	250	1900	0.55	1,400	4,218	25	45%	5.5	0.90	5.0	0.080
179	BASTION CR	5051/11905	2	0.24	300	1000	0.36	600	1,809	17	45%	2.4	0.90	2.1	0.080
180	UNNAMED CR	4948/12625	3	1.2	30	200	0.65	300	1,310	0.5	65%	1.7	0.90	1.5	0.080
181	LUXOR CR	5046/11610	1	0.97	100	1400	0.7	800	2,802	3	52%	3.6	0.90	3.3	0.080
182	ZENITH CR	4952/12316	2	0.11	1159	2800	0.25	1,000	4,133	15	60%	5.3	0.90	4.7	0.082
183	MCLENNAN R @ N.ARM	5251/11921	4	3.3	61	1250	1.2	1,600	5,531	5.5	50%	7.0	0.90	6.3	0.082
184	UNNAMED CR	5021/11648	1	0.3	240	900	0.36	600	2,076	19	50%	2.6	0.90	2.4	0.082
185	CORNING CR	5054/11932	2	0.52	100	700	0.49	400	1,251	0	45%	1.6	0.90	1.4	0.083
186	UNNAMED CR	4959/11603	1	0.75	300	1100	0.5	1,800	5,040	37	40%	6.3	0.90	5.7	0.083
187	NIEUMIAMUS CR	5225/12651	6	2.5	61	1450	1.1	1,200	5,466	10	65%	6.8	0.90	6.1	0.083
188	OCTOPUS CR	4945/11806	1	0.68	150	650	0.49	800	2,255	6	40%	2.8	0.90	2.5	0.084
189	UNNAMED CR	5144/12427	5	0.4	425	3700	0.47	1,300	4,129	1	45%	5.1	0.90	4.6	0.084
190	HENSHAW CR #2	4936/12532	3	2.6	50	500	0.95	1,000	4,591	43	65%	5.7	0.90	5.1	0.084
191	FLEET CR	5330/12027	7	2	91	1500	0.95	1,400	5,044	32	50%	6.1	0.90	5.5	0.086
192	MARGARET CR	4926/12527	3	2.9	50	250	0.87	1,100	4,931	23	62%	6.0	0.90	5.4	0.086
193	CREIGHTON CR	5012/11846	1	0.3	200	1800	0.39	500	1,705	2	47%	2.1	0.90	1.9	0.086
194	NAKA CR	5028/12625	3	3.2	60	750	1.1	1,500	7,024	31	64%	8.4	0.90	7.6	0.087
195	HENSHAW CR #1	4936/12532	3	2.5	50	500	0.94	1,000	4,764	43	65%	5.7	0.90	5.1	0.087

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
196	BEHRMAN CR	5030/11652	1	0.7	240	850	0.88	1,300	4,852	34	50%	5.7	0.90	5.1	0.089
197	POTLATCH CR	4935/12319	2	0.43	150	1300	0.47	500	2,061	1	55%	2.4	0.90	2.2	0.089
198	SHUSHARTIE R	5049/12752	3	4.9	30	750	1.4	1,200	6,119	28	68%	7.1	0.90	6.4	0.089
199	TEIHSUM R	5020/12721	3	2.3	60	1700	1.1	1,100	5,382	17	65%	6.3	0.90	5.6	0.090
200	UNNAMED CR	5419/12824	8	1.2	91	850	0.7	900	4,085	10	60%	4.7	0.90	4.3	0.090
201	BEAR R	5607/12946	11	5.1	30	450	1.3	1,200	5,000	28	55%	5.8	0.90	5.2	0.090
202	CANTON CR	4949/12628	3	3.1	30	800	1.2	700	3,447	1.5	65%	4.0	0.90	3.6	0.090
203	UNNAMED CR	5526/12846	11	0.9	152	1050	0.59	1,100	4,179	16	50%	4.8	0.90	4.3	0.090
204	ARTLISH R	5008/12655	3	5.9	30	600	1.5	1,400	6,955	30	65%	8.0	0.90	7.2	0.091
205	LAKEVIEW CR	4909/12010	2	0.32	550	2900	0.41	1,400	4,818	20	45%	5.5	0.90	5.0	0.091
206	HOLLIDAY CR	5311/11953	7	1.8	91	1400	0.9	1,300	4,971	28	50%	5.7	0.90	5.1	0.091
207	TALA HAAT CR	5446/13004	9	3.1	30	300	1	700	3,523	5	65%	4.0	0.90	3.6	0.092
208	SAN JUAN R	4836/12359	3	2.3	50	750	0.97	900	3,558	18	51%	4.0	0.90	3.6	0.092
209	KILPALA R	5026/12703	3	4.1	60	1700	1.4	1,900	9,575	17	65%	10.8	0.90	9.7	0.092
210	GILLIS CR	5004/11642	1	1.8	120	1200	0.82	1,700	6,624	14	50%	7.4	0.90	6.7	0.093
211	CHAMPION CR	4914/11735	1	0.95	92	500	0.58	700	2,189	4	40%	2.5	0.90	2.2	0.093
212	CLYDE CR #2	5323/12022	7	1.1	91	900	0.68	800	3,134	16	50%	3.5	0.90	3.2	0.093
213	MCLEESE CR	5220/12217	5	0.3	150	1300	0.45	400	1,424	0	45%	1.6	0.90	1.4	0.094
214	CANTON CR WEST	4950/12628	3	2	30	300	0.86	500	2,587	4	65%	2.8	0.90	2.6	0.095
215	OKTWANCH R	4947/12615	3	1.6	30	400	0.83	400	2,072	0.9	65%	2.3	0.90	2.0	0.095
216	SEBALHALL CR	4947/12624	3	2.5	30	400	0.99	600	3,116	10	65%	3.4	0.90	3.1	0.095
217	UNNAMED CR	4919/12605	3	0.41	80	550	0.44	300	1,560	4.5	65%	1.7	0.90	1.5	0.095
218	OUOUKINSH R	5013/12725	3	0.92	120	1100	0.63	900	4,616	21	64%	5.0	0.90	4.5	0.095
219	MCLENNAN R	5250/11920	4	4.9	30	800	1.4	1,200	4,829	4	50%	5.3	0.90	4.7	0.096
220	HANKIN CR	5435/12826	8	1	91	950	0.67	700	3,406	1	60%	3.7	0.90	3.3	0.097
221	UNNAMED CR	5018/12712	3	1	90	600	0.62	700	3,749	27	65%	4.0	0.90	3.6	0.098
222	OUTLET CR	5020/11830	1	0.6	150	1400	0.54	700	2,607	3	45%	2.8	0.90	2.5	0.099
223	MCKALE R	5327/12012	7	1.1	183	1600	0.66	1,600	6,633	25	50%	7.0	0.90	6.3	0.099
224	PINKUT CR FALLS #1	5427/12527	8	6	31	400	N/A	1,500	5,351	30	43%	5.7	0.90	5.1	0.099
225	RALPH R	4938/12531	3	1.7	50	375	0.78	700	3,777	39	65%	4.0	0.90	3.6	0.099
226	UTSUN CR	5527/12735	11	0.74	122	1450	0.61	700	2,906	5	50%	3.1	0.90	2.8	0.099
227	KIMMEL CR	5243/11925	4	1.7	91	820	0.79	1,200	5,018	10	50%	5.3	0.90	4.7	0.100
228	WHITE CR	5051/11919	2	0.6	50	300	0.5	200	1,005	0	60%	1.1	0.90	0.9	0.100
229	PAVILION CR	5054/12146	2	0.15	350	2350	0.36	400	1,686	0	50%	1.8	0.90	1.6	0.100
230	BARR CR	4955/12647	3	3.5	30	400	1.1	800	4,426	10	65%	4.6	0.90	4.1	0.101
231	LUTES CR	4953/12646	3	1.5	60	450	0.74	700	3,878	14	65%	4.0	0.90	3.6	0.101
232	YOOKWA CR	5004/12628	3	2.5	30	800	1.1	600	3,274	3	64%	3.4	0.90	3.0	0.102
233	HOISS CR	4942/12634	3	1.3	60	950	0.8	600	3,332	17	65%	3.4	0.90	3.1	0.102
234	ADOLPH CR #2	5231/11924	4	2.7	61	700	1	1,300	5,588	29	50%	5.7	0.90	5.1	0.102

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
235	UNNAMED CR	5009/11638	1	0.46	240	1000	0.44	900	3,870	21	50%	3.9	0.90	3.5	0.102
236	UNNAMED CR	4918/12004	2	0.08	600	1300	0.2	400	1,380	1	40%	1.4	0.90	1.3	0.103
237	WARD CR	4947/12604	3	0.86	30	200	0.58	200	1,122	0.4	65%	1.1	0.90	1.0	0.103
238	VALLEAU CR	5144/12443	5	1.2	92	1050	0.73	900	3,556	25	45%	3.5	0.90	3.2	0.105
239	UNNAMED CR	5405/12830	8	1	61	950	0.73	500	2,635	5	60%	2.6	0.90	2.4	0.105
240	SOWSAP CR	5026/11846	1	0.42	200	2100	0.49	700	2,774	3.5	45%	2.8	0.90	2.5	0.105
241	JUNIPER CR	5507/12742	11	1.2	91	1550	0.79	900	4,777	8	60%	4.7	0.90	4.3	0.105
242	UNNAMED CR	4950/12538	3	0.9	50	375	0.61	400	2,304	14	65%	2.3	0.90	2.0	0.105
243	TAHSISH R	5016/12705	3	3.7	30	500	1.2	900	5,202	45	65%	5.1	0.90	4.6	0.106
244	STIKELAN CR #1	5128/12424	5	4.8	31	450	1.3	1,200	4,816	22	45%	4.7	0.90	4.3	0.106
245	SOMBRIO R	4831/12417	3	0.87	50	380	0.6	300	1,365	0.5	51%	1.3	0.90	1.2	0.106
246	WILLIS CR	4925/12025	2	0.6	150	1200	0.53	700	2,819	9	45%	2.8	0.90	2.5	0.107
247	UNNAMED CR	4957/12625	3	1.8	30	170	0.74	400	2,337	9	65%	2.3	0.90	2.0	0.107
248	DODJATIN CR	5753/13118	13	0.78	122	750	0.55	700	2,846	12	45%	2.8	0.90	2.5	0.108
249	SHULAPS CR	5056/12217	2	0.58	200	1550	0.52	900	4,244	30	52%	4.1	0.90	3.7	0.108
250	PAUL CR	4915/12001	2	0.67	120	400	0.47	600	2,190	1	40%	2.1	0.90	1.9	0.109
251	UNNAMED CR	4947/12644	3	1.5	60	1150	0.87	700	4,160	19	65%	4.0	0.90	3.6	0.109
252	WILSON CR	4939/12610	3	1.4	40	400	0.76	400	2,380	11	65%	2.3	0.90	2.0	0.109
253	MENHINICK CR	5049/11739	1	0.6	200	900	0.47	900	4,375	53	53%	4.2	0.90	3.8	0.109
254	INSECT CR	5503/12829	11	1.3	152	2550	0.81	1,500	8,257	13	60%	7.9	0.90	7.1	0.109
255	BLACKSTOCK CR	5540/12745	11	0.8	92	550	0.56	600	2,754	20	50%	2.6	0.90	2.4	0.109
256	UNNAMED CR	4939/12604	3	1.4	40	100	0.59	400	2,391	5	65%	2.3	0.90	2.0	0.109
257	UNNAMED CR	5020/12626	3	1.1	120	1000	0.67	1,000	5,929	23	64%	5.6	0.90	5.0	0.110
258	UNNAMED CR	5415/12846	8	0.7	122	800	0.54	700	3,900	21	60%	3.7	0.90	3.3	0.111
259	CLASSY CR	5801/13047	13	0.84	152	900	0.57	1,000	4,188	17	45%	3.9	0.90	3.5	0.111
260	CANTON CR EAST	4950/12628	3	1.1	30	150	0.61	300	1,816	4.4	65%	1.7	0.90	1.5	0.111
261	MURPHY CR	4910/11744	1	0.95	60	500	0.63	400	1,503	2.5	40%	1.4	0.90	1.3	0.112
262	RIOULX CR	5017/11805	1	0.9	200	2000	0.64	1,400	5,975	30	45%	5.5	0.90	5.0	0.113
263	CHIST CR #2	5419/12818	8	2.7	61	975	1	1,300	7,409	16	60%	6.8	0.90	6.1	0.113
264	BRUCE CR	5034/11615	1	2.4	50	400	0.88	900	4,446	12	52%	4.1	0.90	3.7	0.113
265	KASHULT CR	5012/12719	3	1.5	60	950	0.83	700	4,261	32	64%	3.9	0.90	3.5	0.113
266	TABOLT CR TRIB	4930/12606	3	1.5	40	250	0.71	500	3,117	28	65%	2.8	0.90	2.6	0.114
267	MAMAT CR	4959/12655	3	0.63	60	600	0.56	300	1,889	6	65%	1.7	0.90	1.5	0.115
268	DESERTERS CR	5249/12232	5	0.5	100	220	0.41	400	1,434	2	37%	1.3	0.90	1.2	0.115
269	QUARRIE CR	5016/11459	1	1.2	50	550	0.72	500	2,438	12	50%	2.2	0.90	2.0	0.116
270	LITTLE GLACIER CR	5026/11655	1	1.3	60	600	0.72	600	2,940	26	50%	2.6	0.90	2.4	0.117
271	LEGRAND	5325/12023	7	0.5	152	1150	0.49	600	2,947	22	50%	2.6	0.90	2.4	0.117
272	UNNAMED CR	5013/12605	3	0.9	55	900	0.69	400	2,527	13	64%	2.2	0.90	2.0	0.118
273	RED CR	4931/12023	2	0.28	260	1250	0.41	600	2,372	4	40%	2.1	0.90	1.9	0.118

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
274	HOLT CR	5120/11710	4	0.8	92	1500	0.68	600	3,121	3	52%	2.7	0.90	2.5	0.119
275	OLDMAN CR	5129/11715	4	0.5	123	750	0.46	500	2,626	5	52%	2.3	0.90	2.0	0.120
276	UNNAMED CR	4952/12705	3	1.1	60	720	0.71	500	3,302	30	65%	2.8	0.90	2.6	0.121
277	HAANS CR SANDSPIT	5313/13153	9	1.5	62	1900	0.95	700	4,645	4	65%	4.0	0.90	3.6	0.122
278	CARRIGAN CR	5538/12745	11	0.72	91	650	0.55	500	2,576	16	50%	2.2	0.90	2.0	0.123
279	UNNAMED CR	5011/12524	3	0.8	100	1400	0.65	600	4,145	9	67%	3.5	0.90	3.2	0.123
280	KLINAKLINI CR	5152/12456	5	2.5	61	650	0.94	1,200	5,593	11	45%	4.7	0.90	4.3	0.123
281	DURUISEAU CR	4905/12021	2	0.29	250	1600	0.41	600	2,806	24	45%	2.4	0.90	2.1	0.124
282	UTLUH CR	5019/12725	3	1.5	60	920	0.84	700	4,740	10	65%	4.0	0.90	3.6	0.124
283	MIDGE CR	4922/11652	1	5.6	30	1000	1.6	1,300	7,472	33	55%	6.3	0.90	5.6	0.124
284	CIRQUE CR	5126/11706	4	0.4	123	700	0.44	400	2,181	2	52%	1.8	0.90	1.6	0.125
285	LUND CR	5510/12720	11	0.54	153	1000	0.49	600	3,172	16	50%	2.6	0.90	2.4	0.126
286	HARTZ CR	5803/13100	13	0.33	213	1600	0.45	600	2,933	9	45%	2.4	0.90	2.1	0.129
287	VAN HOUTEN CR	4940/11807	1	0.57	150	700	0.47	700	3,099	16	40%	2.5	0.90	2.2	0.132
288	CHRISTIAN CR	5024/11848	1	0.19	200	900	0.36	300	1,497	2	45%	1.2	0.90	1.1	0.132
289	SHAKAN CR	5016/12112	2	0.86	50	200	0.53	300	1,447	2	43%	1.1	0.90	1.0	0.134
290	FENWICK CR	5028/11537	1	2	50	650	0.91	800	4,495	40	50%	3.5	0.90	3.2	0.134
291	MALKSOPE R	5010/12722	3	1.1	60	1050	0.77	500	3,607	26	64%	2.8	0.90	2.5	0.134
292	SINCLAIR CR	5437/12730	8	0.7	100	1500	0.62	500	2,819	17	50%	2.2	0.90	2.0	0.134
293	EHATISAHT CR	4953/12651	3	1.5	60	800	0.82	700	5,155	17	65%	4.0	0.90	3.6	0.135
294	UNNAMED CR	5004/12611	3	0.8	90	1200	0.65	600	4,355	12	64%	3.4	0.90	3.0	0.135
295	BEN ABLE CR	5016/11609	1	0.63	180	1400	0.53	900	5,221	33	50%	3.9	0.90	3.5	0.138
296	TUGWELL CR	4825/12350	3	0.65	50	625	0.59	300	1,784	5	51%	1.3	0.90	1.2	0.139
297	YOUNG CR @ RAPIDS	5232/12554	5	1.2	61	900	0.78	600	4,201	20	60%	3.2	0.90	2.8	0.139
298	COPPERCROWN CR	5022/11621	1	0.3	183	1000	0.41	400	2,338	24	50%	1.8	0.90	1.6	0.139
299	FOURTH OF JULY CR	5940/13339	13	1.8	92	1600	0.92	1,300	4,578	8	30%	3.4	0.90	3.1	0.140
300	HOLSTEIN CR	5018/11835	1	0.29	150	1200	0.41	300	1,605	1	45%	1.2	0.90	1.1	0.142
301	UNNAMED CR	4959/11600	1	0.16	560	1550	0.31	700	3,334	33	40%	2.5	0.90	2.2	0.142
302	UNNAMED CR	4917/12610	3	0.84	40	600	0.67	300	2,333	6.5	65%	1.7	0.90	1.5	0.142
303	PEGGATTEM CR	5038/12759	3	1.5	30	550	0.87	400	3,282	29	68%	2.4	0.90	2.1	0.144
304	HECTATE LAKE	4953/12647	3	1.1	30	500	0.76	300	2,359	16	65%	1.7	0.90	1.5	0.144
305	STOCKDALE CR	5035/11635	1	2.6	50	700	1	1,000	6,299	38	52%	4.6	0.90	4.1	0.144
306	CHESHI CR	5128/12422	5	0.8	92	450	0.54	600	3,283	22	45%	2.4	0.90	2.1	0.145
307	FAIRY CR	4836/12420	3	0.55	50	125	0.44	200	1,254	5.5	51%	0.9	0.90	0.8	0.146
308	MOOYAH R	4937/12625	3	1.7	40	900	0.95	500	3,997	32	65%	2.8	0.90	2.6	0.146
309	NINE MILE CR	5759/13102	13	0.2	213	950	0.36	300	1,667	13	45%	1.2	0.90	1.1	0.147
310	MAYDOE CR	5208/12516	5	0.7	213	3250	0.62	1,200	8,909	35	60%	6.3	0.90	5.7	0.147
311	CIRIACO CR	4956/12649	3	0.49	90	550	0.46	300	2,422	8	65%	1.7	0.90	1.5	0.148
312	HIDDEN CR	4914/11710	1	1.5	30	250	0.75	400	2,005	5	40%	1.4	0.90	1.3	0.149

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
313	RELIANCE CR	5123/12441	5	1.7	92	350	0.68	1,200	7,525	50	50%	5.3	0.90	4.7	0.149
314	HESQUIAT PT CR	4925/12623	3	1.5	40	700	0.87	500	4,112	38	65%	2.8	0.90	2.6	0.151
315	CHIST CR #1	5419/12824	8	3.4	31	700	1.2	800	6,111	13	60%	4.2	0.90	3.8	0.152
316	MEEHAUS CR	5805/13043	13	0.97	92	670	0.62	700	4,044	20	45%	2.8	0.90	2.5	0.153
317	HOWSON CR	5433/12721	8	2	50	700	0.91	800	5,159	28	50%	3.5	0.90	3.2	0.154
318	PETERSON CR	5112/12010	4	0.3	100	300	0.36	200	1,118	3	43%	0.8	0.90	0.7	0.155
319	MABLE CR	5037/11836	1	0.22	250	800	0.36	400	2,447	11	47%	1.6	0.90	1.5	0.155
320	KENDRICK CR	4944/12639	3	1.6	30	620	0.91	400	3,435	23	65%	2.3	0.90	2.0	0.157
321	MATCHLEE CR	4939/12603	3	1.4	40	100	0.59	400	3,444	11	65%	2.3	0.90	2.0	0.158
322	JAMISON CR	5132/12426	5	0.4	396	3400	0.47	1,200	7,231	15	45%	4.7	0.90	4.3	0.159
323	STEWART CR	4907/11815	1	0.19	250	1050	0.31	400	2,198	8	40%	1.4	0.90	1.3	0.164
324	GOATSKIN CR	4943/11839	1	1.2	100	1000	0.71	900	6,270	60	50%	3.9	0.90	3.5	0.166
325	UNNAMED CR	5308/13153	9	1.3	30	600	0.84	300	2,961	11	70%	1.8	0.90	1.7	0.168
326	UNNAMED CR	4917/12610	3	0.79	40	375	0.6	200	1,933	6.5	67%	1.2	0.90	1.1	0.172
327	UNNAMED CR	4905/12043	2	0.18	150	825	0.36	200	1,477	11	50%	0.9	0.90	0.8	0.176
328	ARTHURS CR	4941/11843	1	0.4	280	2000	0.44	900	5,377	50	40%	3.2	0.90	2.8	0.178
329	UNNAMED CR	5008/12711	3	2.3	30	500	0.99	500	4,799	38	64%	2.8	0.90	2.5	0.179
330	MARBLE R	5016/12720	3	0.93	60	900	0.7	400	3,925	17	65%	2.3	0.90	2.0	0.180
331	EAST CR	5042/11653	1	2.9	50	500	0.99	1,100	8,637	72	52%	5.0	0.90	4.5	0.180
332	AZURE R #2	5232/11947	4	8	30	900	1.8	1,900	14,497	60	50%	8.3	0.90	7.5	0.182
333	LINCOLN CR	5141/12424	5	0.1	213	1500	0.31	200	1,381	2	45%	0.8	0.90	0.7	0.183
334	AZURE R #1	5235/11948	4	3.4	61	800	1.1	1,600	12,326	60	50%	7.0	0.90	6.3	0.183
335	NARROWGUT CR	5000/12707	3	1.8	30	400	0.87	400	4,057	27	65%	2.3	0.90	2.0	0.186
336	MCCLINCHY CR	5207/12510	5	3.1	30	800	1.2	700	6,604	33	60%	3.7	0.90	3.3	0.187
337	UNNAMED CR	4923/12604	3	0.77	40	300	0.57	200	2,110	17	65%	1.1	0.90	1.0	0.193
338	FELLOWS CR	4840/12353	3	0.45	50	250	0.44	200	1,710	15	51%	0.9	0.90	0.8	0.200
339	UNNAMED CR	4952/12650	3	1	30	350	0.69	200	2,210	19	65%	1.1	0.90	1.0	0.202
340	HITCHCOCK CR	5955/13348	13	1.8	62	1025	0.9	900	4,639	40	30%	2.4	0.90	2.1	0.205
341	TLELL R	5322/13200	9	2.2	30	600	1	500	5,598	14	65%	2.8	0.90	2.6	0.205
342	ASSINIBOINE CR	5048/11540	1	0.53	240	1500	0.48	1,000	8,881	47	50%	4.4	0.90	3.9	0.211
343	BOUNDING CR	5328/12039	7	0.5	92	800	0.52	400	3,686	37	50%	1.8	0.90	1.6	0.219
344	DOG CR	4924/11807	1	1.3	50	400	0.71	500	3,687	35	40%	1.8	0.90	1.6	0.219
345	UNNAMED CR	5155/12444	5	0.5	61	750	0.53	200	1,487	1	40%	0.7	0.90	0.6	0.221
346	MEGIN R TRIBUTARY	4932/12601	3	1.3	40	275	0.69	400	5,087	47	65%	2.3	0.90	2.0	0.233
347	UNNAMED CR	4927/12605	3	0.57	40	220	0.48	200	2,562	30	65%	1.1	0.90	1.0	0.235
348	EIGHT MILE CR	5758/13105	13	0.27	91	150	0.31	200	1,813	10	45%	0.8	0.90	0.7	0.240
349	UNNAMED CR	4923/12607	3	0.41	40	400	0.48	100	1,867	13	65%	0.6	0.90	0.5	0.342
350	SKULL CR	5109/12013	4	0.18	100	250	0.3	100	1,260	7	43%	0.4	0.90	0.3	0.349
351	UNNAMED CR	4955/12648	3	0.49	30	90	0.44	100	2,153	9	65%	0.6	0.90	0.5	0.394

TABLE 4.1a Inventory of Small Hydro Sites (less than 2MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
352	UNNAMED CR	4921/12601	3	0.37	40	250	0.44	100	2,210	16	65%	0.6	0.90	0.5	0.405
353	UNNAMED CR	4924/12617	3	0.38	40	150	0.41	100	2,242	29	65%	0.6	0.90	0.5	0.411

TABLE 4.2 Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
1	ASHER CR	5036/11729	1	3.4	150	2100	1.1	4,000	12,181	54	53%	18.6	0.90	16.7	0.068
2	BEATRICE CR	4950/11728	1	4.1	165	750	0.98	5,300	8,363	7	45%	20.9	0.90	18.8	0.042
3	BEATTON CR	5044/11744	1	2.8	150	2000	1	3,300	8,615	50	63%	18.2	0.90	16.4	0.049
4	BERNARD CR	4952/11651	1	1.7	180	1200	0.75	2,400	5,323	20	45%	9.5	0.90	8.5	0.059
5	BOYD CR	5053/11734	1	2.2	250	1800	0.84	4,300	11,870	64	53%	20.0	0.90	18.0	0.062
6	BRENNER CR	5013/11730	1	3.5	120	1900	1.2	3,300	8,919	26	47%	13.6	0.90	12.2	0.068
7	CAMPBELL CR	4957/11651	1	2.7	240	2400	0.97	5,100	12,247	28	45%	20.1	0.90	18.1	0.064
8	CARIBOU CR	4959/11750	1	6.1	120	1350	1.3	5,700	9,142	2.5	45%	22.5	0.90	20.2	0.042
9	CASCADE CR	5025/11707	1	1.9	180	1800	0.84	2,700	5,275	14.5	57%	13.5	0.90	12.1	0.041
10	CLINT CR	5013/11654	1	2.4	243	2000	0.89	4,600	7,684	1	50%	20.1	0.90	18.1	0.040
11	CLUTE CR	5001/11653	1	0.81	609	3200	0.55	3,900	9,017	8	50%	17.1	0.90	15.4	0.055
12	COCHRANE CR	4940/11844	1	0.53	500	2600	0.47	2,100	6,863	45	40%	7.4	0.90	6.6	0.097
13	COOKE CR	5037/11850	1	1.9	200	2100	0.86	3,000	5,521	0.5	45%	11.8	0.90	10.6	0.049
14	COOPER CR	5012/11659	1	4.6	183	5100	1.4	6,600	21,728	1.5	47%	27.2	0.90	24.5	0.083
15	CRAWFORD CR	5045/11759	1	1.1	250	1300	0.61	2,200	4,207	21	53%	10.2	0.90	9.2	0.043
16	CULTUS CR	4920/11647	1	3.9	123	1800	1.2	3,800	8,525	27	55%	18.3	0.90	16.5	0.049
17	DERRY CR	5046/11833	1	1.3	300	2350	0.71	3,100	6,130	22	45%	12.2	0.90	11.0	0.052
18	DIORITE CR	4958/11540	1	1.3	490	4100	0.72	5,000	12,906	2	40%	17.5	0.90	15.8	0.077
19	EAST CR #1	5039/11702	1	7	50	500	1.4	2,700	6,667	42	53%	12.5	0.90	11.3	0.055
20	EAST CR #2	5039/11701	1	7	100	1150	1.4	5,500	11,726	45	53%	25.5	0.90	23.0	0.048
21	FITZSTUBBS CR	5009/11722	1	11	60	2000	2.1	5,200	13,741	13	47%	21.4	0.90	19.3	0.067
22	FOSTHALL CR	5022/11757	1	8.8	60	225	1.3	4,100	7,197	34	47%	16.9	0.90	15.2	0.044
23	GIEGERICH CR	5043/11707	1	4.6	100	1100	1.2	3,600	8,970	55	53%	16.7	0.90	15.0	0.056
24	GWILLIM CR	4945/11728	1	2.4	240	1100	0.8	4,500	5,597	1	45%	17.7	0.90	16.0	0.033
25	HADOW CR	5040/11748	1	1.4	400	950	0.59	4,400	7,831	41	53%	20.4	0.90	18.4	0.040
26	HALFWAY HOTSPRINGS	5029/11751	1	13	60	1300	2	6,100	12,510	22	47%	25.1	0.90	22.6	0.052
27	HELLROARER CR	4935/11845	1	0.71	400	1750	0.5	2,200	5,459	30	40%	7.7	0.90	6.9	0.074
28	KELLIE CR	5055/11734	1	1.8	250	1150	0.71	3,500	10,099	65	53%	16.2	0.90	14.6	0.065
29	LAIDLAW CR	5052/11714	1	2.2	150	1400	0.88	2,600	8,083	73	53%	12.1	0.90	10.9	0.070
30	LASCA CR	4936/11709	1	1.5	300	2100	0.72	3,500	5,460	1	45%	13.8	0.90	12.4	0.041
31	LATEWHOS CR	5027/11843	1	0.65	450	2600	0.51	2,300	4,224	8	45%	9.1	0.90	8.2	0.049
32	LOKI CR	4950/11651	1	0.87	430	2400	0.57	2,900	6,278	14	45%	11.4	0.90	10.3	0.057
33	MCDONALD CR	5034/11625	1	1.8	250	1100	0.71	3,500	6,652	36	52%	15.9	0.90	14.3	0.044
34	MCDOUGAL CR	5058/11737	1	3.4	150	850	0.95	4,000	12,334	80	53%	18.6	0.90	16.7	0.069
35	MULVEHILL CR	5051/11807	1	1.9	150	550	0.7	2,200	3,515	17	45%	8.7	0.90	7.8	0.042
36	NEXT CR	4918/11645	1	3.6	120	1100	1.1	3,400	6,093	25	55%	16.4	0.90	14.7	0.039
37	POPLAR CR	5026/11708	1	4.2	120	2700	1.3	3,900	10,575	17	47%	16.1	0.90	14.5	0.069
38	POWDER CR	4953/11651	1	1.4	370	2500	0.7	4,100	8,458	23	45%	16.2	0.90	14.5	0.055
39	RAPID CR	5027/11710	1	1.2	300	2400	0.67	2,800	6,196	21	47%	11.5	0.90	10.4	0.056

TABLE 4.2 Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
40	SANCA CR	4923/11643	1	2.3	120	1000	0.88	2,200	4,973	25	55%	10.6	0.90	9.5	0.049
41	SHANNON CR	5005/11729	1	1.5	180	1700	0.76	2,100	3,696	2	47%	8.6	0.90	7.8	0.045
42	SHAW CR	4915/11643	1	1.1	240	1000	0.59	2,100	3,879	21	55%	10.1	0.90	9.1	0.040
43	SICAMOUS CR	5048/11858	1	1.6	200	1400	0.74	2,500	3,599	0	45%	9.9	0.90	8.9	0.038
44	SOUTH CRANBERRY CR	5046/11806	1	2.7	200	900	0.83	4,200	6,476	29	52%	19.1	0.90	17.2	0.035
45	TAM O'SHANTER CR	4948/11651	1	0.96	490	3000	0.6	3,700	7,529	10	45%	14.6	0.90	13.1	0.054
46	TENDERFOOT CR	5028/11713	1	1.5	240	2500	0.78	2,800	6,753	28	47%	11.5	0.90	10.4	0.061
47	TSUIUS CR	5037/11840	1	5	150	1650	1.2	5,900	9,968	7	47%	24.3	0.90	21.9	0.043
48	UNNAMED CR	5057/11824	1	1.2	300	1100	0.59	2,800	3,796	6	45%	11.0	0.90	9.9	0.036
49	UNNAMED CR	5059/11645	1	0.72	400	1100	0.47	2,300	4,760	34	52%	10.5	0.90	9.4	0.047
50	VOWELL CR	5053/11652	1	5.9	50	800	1.4	2,300	8,743	50	52%	10.5	0.90	9.4	0.087
51	WARREN CR	5058/11642	1	1.4	550	3400	0.69	6,000	14,891	30	52%	27.3	0.90	24.6	0.057
52	WEE SANDY CR	5000/11725	1	1.8	180	900	0.72	2,500	4,430	10	47%	10.3	0.90	9.3	0.045
53	WILSON CR	4935/11652	1	0.58	609	2700	0.47	2,800	5,547	12	55%	13.5	0.90	12.1	0.043
54	WILSON CR FALLS	5008/11720	1	9.2	60	550	1.5	4,300	7,809	11	47%	17.7	0.90	15.9	0.046
55	WOODBURY CR	4948/11657	1	1.9	300	3900	0.9	4,500	11,461	6	55%	21.7	0.90	19.5	0.055
56	WRAGGE CR	5004/11728	1	1.1	244	1800	0.66	2,100	4,747	2	45%	8.3	0.90	7.5	0.060
57	YARD CR	5054/11848	1	3.1	150	1550	1	3,600	5,767	0	45%	14.2	0.90	12.8	0.042
58	AIRPLANE CR	4908/12137	2	0.9	300	1400	0.56	2,100	4,646	7	63%	11.6	0.90	10.4	0.042
59	BEAR CR	4928/12146	2	1.6	365	2100	0.71	4,600	7,836	20	60%	24.2	0.90	21.8	0.034
60	BIRKENHEAD R #1	5020/12243	2	23	30	200	2	5,400	9,715	1	63%	29.8	0.90	26.8	0.034
61	BOX CANYON CR	4935/12324	2	0.76	400	1400	0.5	2,400	3,332	2	55%	11.6	0.90	10.4	0.030
62	CANTELON/YOLA CR	4913/12123	2	3	105	2000	1.1	2,500	7,135	22	63%	13.8	0.90	12.4	0.054
63	CAYOOSH CR #2	5039/12159	2	21	30	800	2.5	4,900	11,734	4	53%	22.7	0.90	20.5	0.054
64	CHICKWAT CR	4949/12343	2	3.7	180	1050	0.98	5,200	7,982	27	55%	25.1	0.90	22.5	0.033
65	CLOWHOM R	4951/12327	2	3.6	120	1000	1	3,400	9,079	25	55%	16.4	0.90	14.7	0.058
66	CLOWHOM R	4949/12323	2	7.8	60	400	1.3	3,700	7,430	19	55%	17.8	0.90	16.0	0.043
67	CLOWHOM R	4950/12329	2	1.7	320	600	0.6	4,300	9,249	27	55%	20.7	0.90	18.6	0.047
68	COGBURN CR	4933/12145	2	5.9	100	1050	1.3	4,600	8,160	35	60%	24.2	0.90	21.8	0.035
69	CONNEL CR	5039/12225	2	0.65	950	3800	0.48	4,800	11,068	0.5	52%	21.9	0.90	19.7	0.053
70	FISH HATCHERY CR	4936/12238	2	1.1	670	1600	0.53	5,800	9,834	50	55%	27.9	0.90	25.1	0.037
71	FRIES CR	4945/12309	2	1.6	180	1100	0.72	2,300	4,017	3	55%	11.1	0.90	10.0	0.038
72	FURRY CR	4935/12313	2	3.6	230	1600	1	6,500	9,858	6	57%	32.5	0.90	29.2	0.032
73	GOLD CR	4921/12227	2	5.3	50	250	1.1	2,100	4,675	16	55%	10.1	0.90	9.1	0.048
74	GREY CR	4932/12345	2	3.6	95	700	1	2,700	4,705	8	55%	13.0	0.90	11.7	0.038
75	HIGH CR	4955/12352	2	2.2	210	1000	0.77	3,600	5,907	21	55%	17.3	0.90	15.6	0.036
76	JOFFRE CR	4918/12235	2	3.8	190	900	0.96	5,700	7,136	10	57%	28.5	0.90	25.6	0.026
77	LAKE LOVELY WATER	4948/12313	2	0.75	1100	3400	0.48	6,500	14,771	9	60%	34.2	0.90	30.7	0.045
78	LIZZIE CR	5012/12228	2	3.5	230	2000	1	6,300	11,273	11	57%	31.5	0.90	28.3	0.037

TABLE 4.2 Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
79	LOST VALLEY CR	5040/12218	2	0.94	350	1050	0.52	2,600	4,282	6	52%	11.8	0.90	10.7	0.038
80	LYNN CR	4921/12301	2	4	75	1800	1.3	2,300	4,755	0	55%	11.1	0.90	10.0	0.045
81	MASELPANIK CR	4907/12115	2	2.3	300	2500	0.88	5,400	11,741	37	63%	29.8	0.90	26.8	0.041
82	MAWBY CR	4953/12318	2	0.65	580	1150	0.44	3,000	4,999	2	55%	14.5	0.90	13.0	0.036
83	MCGILLIVARY CR	5037/12226	2	1.2	350	1300	0.59	3,300	4,687	1	52%	15.0	0.90	13.5	0.033
84	MCNAIR CR	4931/12330	2	2.1	180	1600	0.86	3,000	5,470	1	55%	14.5	0.90	13.0	0.039
85	MCNULTY CR	4925/12005	2	1.3	250	1900	0.69	2,500	5,875	10	40%	8.8	0.90	7.9	0.070
86	MONMOUTH CR	4943/12311	2	0.59	470	1000	0.44	2,200	4,010	3	55%	10.6	0.90	9.5	0.039
87	NICOAMEN CR	5016/12124	2	1.5	200	600	0.36	2,300	3,613	10	50%	10.1	0.90	9.1	0.037
88	OWL CR	5022/12244	2	2.2	150	900	0.81	2,600	4,323	1	62%	14.1	0.90	12.7	0.032
89	PERKETTS CR	4953/12352	2	1.9	340	1000	0.68	5,100	6,979	15	55%	24.6	0.90	22.1	0.030
90	RAINY R	4932/12330	2	7	60	800	1.5	3,300	6,541	3	55%	15.9	0.90	14.3	0.043
91	RED TUSK CR	4947/12325	2	2.6	180	1400	0.9	3,700	6,977	13	55%	17.8	0.90	16.0	0.041
92	ROARING CR	4927/12213	2	1.4	200	900	0.65	2,200	4,538	25	55%	10.6	0.90	9.5	0.045
93	SCUZZZY CR	4949/12128	2	7.9	70	1100	1.6	4,300	8,268	3	47%	17.7	0.90	15.9	0.049
94	SIWASH CR	4934/12124	2	3	200	600	0.81	4,700	8,989	12	50%	20.6	0.90	18.5	0.046
95	SOWERBY CR	4919/12126	2	1.4	425	3400	0.71	4,700	10,653	7	63%	25.9	0.90	23.3	0.043
96	SPUZZUM CR	4939/12126	2	7.5	50	500	1.4	2,900	5,390	2	60%	15.2	0.90	13.7	0.037
97	STAWAMUS CR	4942/12307	2	2.8	274	2650	0.97	6,000	11,029	3	55%	28.9	0.90	26.0	0.040
98	TANTALUS CR	4951/12315	2	0.9	762	3000	0.45	5,400	10,436	2	55%	26.0	0.90	23.4	0.042
99	TEXAS CR	5034/12149	2	2.6	150	900	0.86	3,100	4,667	18	50%	13.6	0.90	12.2	0.036
100	THOMAS LAKE	4936/12225	2	1.1	520	1700	0.57	4,500	7,704	50	60%	23.7	0.90	21.3	0.034
101	THORNHILL CR	4940/12336	2	1.2	459	1250	0.57	4,300	6,065	0	55%	20.7	0.90	18.6	0.031
102	TIPELLA CR	4945/12210	2	4.9	90	300	0.99	3,500	4,510	0	55%	16.9	0.90	15.2	0.028
103	TOMMY CR	5050/12231	2	1.2	300	1800	0.64	2,800	5,074	20	52%	12.8	0.90	11.5	0.041
104	TSILEUH CR	4946/12126	2	0.87	700	3900	0.57	4,800	9,842	5	47%	19.8	0.90	17.8	0.052
105	TWENTYONE MILE CR	5007/12259	2	2.2	185	1000	0.8	3,200	4,965	1.5	60%	16.8	0.90	15.1	0.031
106	TZOONIE CR	4947/12343	2	11	30	320	1.7	2,600	7,003	23	55%	12.5	0.90	11.3	0.058
107	UNNAMED CR	4949/12323	2	0.38	793	1150	0.36	2,400	4,757	17	55%	11.6	0.90	10.4	0.043
108	UNNAMED CR	4945/12343	2	1.5	214	600	0.62	2,500	3,866	18	55%	12.0	0.90	10.8	0.033
109	UNNAMED CR	4940/12151	2	0.65	540	2000	0.47	2,700	7,578	55	60%	14.2	0.90	12.8	0.056
110	UNNAMED CR	4943/12345	2	1	427	1200	0.54	3,300	4,816	17	55%	15.9	0.90	14.3	0.032
111	UNNAMED CR	4945/12327	2	0.88	550	1100	0.48	3,800	4,966	11	55%	18.3	0.90	16.5	0.028
112	UNNAMED CR	5001/12321	2	1.8	275	700	0.64	3,900	7,158	15	55%	18.8	0.90	16.9	0.040
113	UNNAMED CR	4955/12348	2	0.88	579	3000	0.56	4,000	7,884	25	55%	19.3	0.90	17.3	0.043
114	UNNAMED CR	4957/12150	2	2.3	250	1500	0.83	4,500	8,500	28	47%	18.5	0.90	16.7	0.048
115	UNNAMED CR	4950/12131	2	2	300	2200	0.82	4,700	8,972	9	47%	19.4	0.90	17.4	0.048
116	UNNAMED CR	4948/12324	2	0.8	793	2700	0.49	5,000	10,111	15	55%	24.1	0.90	21.7	0.044
117	UNNAMED CR	4947/12334	2	1.4	457	1200	0.6	5,000	9,471	17	55%	24.1	0.90	21.7	0.041

TABLE 4.2 Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
118	UNNAMED CR	4945/12331	2	5.5	122	350	1	5,300	5,633	6	55%	25.5	0.90	23.0	0.023
119	UNNAMED CR	4909/12120	2	1.2	243	2100	0.69	2,300	6,593	30	63%	12.7	0.90	11.4	0.054
120	UNNAMED CR	4946/12326	2	0.62	458	1100	0.45	2,200	3,955	14	55%	10.6	0.90	9.5	0.039
121	VANCOUVER CR	4956/12348	2	8.1	60	900	1.6	3,800	8,393	25	55%	18.3	0.90	16.5	0.048
122	WEDGE CR	5010/12254	2	3.6	215	1500	1	6,100	9,166	2	60%	32.1	0.90	28.9	0.030
123	BONANZA R	5020/12644	3	4.4	60	1400	1.4	2,100	5,554	0.8	68%	12.5	0.90	11.3	0.046
124	BROWNS R# 1	4941/12509	3	5.9	50	400	1.2	2,300	4,041	2.1	65%	13.1	0.90	11.8	0.032
125	BROWNS R# 2	4942/12508	3	6.4	50	750	1.4	2,500	5,133	2	65%	14.2	0.90	12.8	0.038
126	CAMERON R	4915/12440	3	6.2	50	250	1.2	2,400	4,339	9	55%	11.6	0.90	10.4	0.039
127	CATHERINE CR	5025/12636	3	3	90	1100	1	2,100	7,563	19	68%	12.5	0.90	11.3	0.063
128	CERVUS CR @ LADY F	4951/12547	3	5.5	100	380	1.1	4,300	5,121	1.6	65%	24.5	0.90	22.0	0.022
129	CRUICKSHANK CR	4936/12515	3	5.4	150	2000	1.3	6,300	11,809	18	65%	35.9	0.90	32.3	0.034
130	ENGLISHMAN CR	4915/12421	3	10	50	1630	2	3,900	10,074	2.3	55%	18.8	0.90	16.9	0.056
131	GOLD R	4952/12606	3	20	30	900	2.5	4,700	11,664	4.4	65%	26.8	0.90	24.1	0.045
132	HANDY CR	4900/12456	3	3.8	100	310	0.89	3,000	4,771	29	62%	16.3	0.90	14.7	0.031
133	KAIPIT CR	5015/12648	3	9.7	60	700	1.6	4,600	7,655	6	65%	26.2	0.90	23.6	0.030
134	KOKISH R	5028/12648	3	5.5	60	1400	1.5	2,600	6,523	2.8	68%	15.5	0.90	13.9	0.044
135	KOKISH R	5029/12650	3	17	30	950	2.4	4,000	10,132	0.7	68%	23.8	0.90	21.4	0.044
136	KOKISH R	5027/12647	3	5.2	127	1900	1.3	5,200	9,964	3	68%	31.0	0.90	27.9	0.034
137	KUNNUM CR	5018/12614	3	2.9	91	2050	1.2	2,100	7,513	27	64%	11.8	0.90	10.6	0.067
138	MAQUILLA CR	5005/12625	3	3.4	90	1650	1.2	2,400	5,649	0.8	64%	13.5	0.90	12.1	0.044
139	MARBLE R CANYON	5026/12723	3	11	33	1700	2.2	2,800	11,136	5	70%	17.2	0.90	15.5	0.068
140	MAYNARD L	5024/12714	3	9.1	64	550	1.5	4,600	7,582	18	65%	26.2	0.90	23.6	0.030
141	MOAKWA CR	5007/12602	3	3.1	90	1250	1.1	2,200	6,124	22	64%	12.3	0.90	11.1	0.052
142	MONTAGUE CR	5020/12612	3	2.2	152	1500	0.9	2,600	6,625	22	64%	14.6	0.90	13.1	0.047
143	MYRA CR AT FALLS	4935/12534	3	5.3	50	1200	1.5	2,100	7,919	40	65%	12.0	0.90	10.8	0.069
144	PHILLIPS CR	4940/12534	3	8	50	500	1.5	3,100	9,749	27	65%	17.7	0.90	15.9	0.058
145	PIGGOTT CR	4949/12522	3	5.3	50	250	1.1	2,100	4,308	14	65%	12.0	0.90	10.8	0.038
146	PINDER CR	5015/12655	3	3	90	2100	1.2	2,100	6,444	16	65%	12.0	0.90	10.8	0.056
147	ROSEWALL C	4927/12448	3	2.9	100	630	0.91	2,300	3,368	1	62%	12.5	0.90	11.2	0.028
148	SALMON R	5005/12641	3	7.5	50	700	1.5	2,900	7,049	19	67%	17.0	0.90	15.3	0.043
149	SAUNDERS CR	4948/12601	3	3.1	90	1200	1.1	2,200	4,459	2	65%	12.5	0.90	11.3	0.037
150	SOUTH ENGLISHMAN R	4915/12417	3	4.6	100	2000	1.3	3,600	9,037	5	55%	17.3	0.90	15.6	0.054
151	THELWOOD CR	4933/12534	3	2.9	100	1000	1	2,300	5,314	41	65%	13.1	0.90	11.8	0.042
152	TLATLOS CR	5023/12614	3	2.1	182	2275	0.92	3,000	8,577	26	64%	16.8	0.90	15.1	0.053
153	TLUPANA R	4946/12620	3	2.9	90	1850	1.1	2,000	6,004	2	65%	11.4	0.90	10.2	0.055
154	TSABLE R	4931/12454	3	6.8	50	500	1.4	2,700	4,626	4	65%	15.4	0.90	13.8	0.031
155	UCONA R	4944/12557	3	6.6	50	200	1.1	2,600	4,771	10	65%	14.8	0.90	13.3	0.034
156	UNNAMED CR	4946/12541	3	2.5	200	1060	0.83	3,900	9,138	20	65%	22.2	0.90	20.0	0.043

TABLE 4.2 Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
157	ZEBALLOS (LITTLE) R	4959/12645	3	1.5	210	750	0.64	2,500	3,385	6	65%	14.2	0.90	12.8	0.025
158	ZEBALLOS L	5003/12646	3	5.4	90	1250	1.3	3,800	8,202	10	65%	21.6	0.90	19.5	0.040
159	ZEBALLOS R	5003/12647	3	5.6	60	800	1.3	2,600	5,458	10	65%	14.8	0.90	13.3	0.038
160	ADOLPH CR #1	5231/11923	4	2.8	213	3400	1.1	4,700	15,390	29	50%	20.6	0.90	18.5	0.078
161	ALLAN CR	5232/11907	4	4.3	91	1900	1.3	3,100	7,643	12	50%	13.6	0.90	12.2	0.059
162	BULLDOG CR	5239/11859	4	3.6	152	875	0.97	4,300	10,910	26	50%	18.8	0.90	17.0	0.060
163	CLEMINA CR	5234/11905	4	2.5	152	1300	0.9	3,000	5,458	10	50%	13.1	0.90	11.8	0.043
164	DAVE HENRY CR #2	5245/11905	4	3.5	91	550	0.97	2,500	5,156	11	50%	11.0	0.90	9.9	0.049
165	GHITA CR	5251/11839	4	2.7	306	2750	0.94	6,500	15,392	31	50%	28.5	0.90	25.6	0.056
166	GRANT BROOK	5254/11845	4	3.9	152	1500	1.1	4,600	9,248	21	50%	20.1	0.90	18.1	0.048
167	MCLENNAN R @ S.ARM	5251/11921	4	1.4	244	1450	0.69	2,700	5,270	6	50%	11.8	0.90	10.6	0.046
168	PTARMIGAN CR	5235/11850	4	9.5	61	1600	1.8	4,500	13,136	40	50%	19.7	0.90	17.7	0.070
169	SWIFT CR #1	5252/11913	4	3.3	91	1325	1.1	2,400	6,178	5	50%	10.5	0.90	9.5	0.061
170	UNNAMED CR	5254/11846	4	2.5	152	520	0.77	3,000	4,968	24	50%	13.1	0.90	11.8	0.039
171	UNNAMED CR	5255/11853	4	2.6	184	330	0.71	3,700	5,373	11	50%	16.2	0.90	14.6	0.035
172	JANET CR	5223/12552	5	1	610	1950	0.53	4,800	9,015	32	65%	27.3	0.90	24.6	0.034
173	MOSHER CR	5225/12558	5	1.1	457	2400	0.6	3,900	8,222	32	65%	22.2	0.90	20.0	0.039
174	STIKELAN CR #2	5127/12422	5	3.3	91	900	1	2,400	6,732	25	45%	9.5	0.90	8.5	0.074
175	UNNAMED CR	5126/12445	5	1.1	336	1350	0.58	2,900	13,355	60	50%	12.7	0.90	11.4	0.110
176	CACOOHTIN CR	5226/12619	6	1.7	214	1200	0.73	2,800	4,962	2	65%	15.9	0.90	14.3	0.032
177	CLAYTON FALLS CR	5222/12649	6	6.6	61	700	1.4	3,200	6,180	0	65%	18.2	0.90	16.4	0.035
178	MILL CR	5224/12634	6	1.1	638	2200	0.56	5,500	7,841	1.5	65%	31.3	0.90	28.2	0.026
179	NOOKLIKONNIK CR	5222/12634	6	1.7	366	2400	0.75	4,900	9,145	2	65%	27.9	0.90	25.1	0.034
180	NOOMST CR #1	5223/12615	6	1.3	427	2950	0.69	4,300	9,226	7	65%	24.5	0.90	22.0	0.039
181	NORDSCHOW CR	5218/12603	6	2.9	183	1500	0.95	4,200	9,878	20	65%	23.9	0.90	21.5	0.043
182	SALLOOMT CR	5227/12632	6	8.6	31	850	1.8	2,100	7,114	7	65%	12.0	0.90	10.8	0.062
183	SMITELY R @ FALLS	5205/12636	6	18.6	31	450	2.1	4,500	11,693	56	65%	25.6	0.90	23.1	0.048
184	SNOOTLI CR	5223/12636	6	2.2	152	1250	0.86	2,600	4,627	0.5	65%	14.8	0.90	13.3	0.033
185	THORSEN CR	5221/12642	6	6.1	80	1550	1.5	3,800	7,739	1	65%	21.6	0.90	19.5	0.037
186	TSEAPSEAHOOLZ CR	5226/12624	6	1.3	274	1900	0.68	2,800	5,722	0.5	65%	15.9	0.90	14.3	0.037
187	UNNAMED CR	5221/12640	6	0.4	1036	2700	0.41	3,200	6,848	0.5	65%	18.2	0.90	16.4	0.039
188	UNNAMED CR	5210/12650	6	3.2	152	1050	0.96	3,800	7,179	31	65%	21.6	0.90	19.5	0.035
189	DORE CR #1	5316/12017	7	6.8	92	1600	1.5	4,900	9,958	13	50%	21.5	0.90	19.3	0.048
190	DORE CR #2	5313/12017	7	5.2	91	1500	1.4	3,700	8,963	17	50%	16.2	0.90	14.6	0.058
191	HORSEY CR	5308/11941	7	5.9	122	2050	1.4	5,600	12,878	14	50%	24.5	0.90	22.1	0.055
192	ROBSON R	5303/11913	7	6.1	61	1050	1.5	2,900	6,218	2.5	50%	12.7	0.90	11.4	0.051
193	SMALL CR	5304/11935	7	9.1	61	1400	1.8	4,300	10,800	7	50%	18.8	0.90	17.0	0.060
194	SWIFTCURRENT CR	5301/11917	7	5.8	61	800	1.4	2,800	5,640	0.5	50%	12.3	0.90	11.0	0.048
195	UNNAMED CR	5308/12001	7	0.9	335	1300	0.55	2,400	7,875	23	50%	10.5	0.90	9.5	0.078

TABLE 4.2 Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED:Alphabetic by region*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
196	UNNAMED CR	5321/11951	7	1.3	274	2000	0.69	2,800	13,742	32	50%	12.3	0.90	11.0	0.117
197	UNNAMED CR	5310/12002	7	0.5	549	1700	0.41	2,100	6,236	18	50%	9.2	0.90	8.3	0.071
198	BOLTON CR	5413/12826	8	4.8	61	1050	1.3	2,300	7,845	18	60%	12.1	0.90	10.9	0.068
199	CHIMDEMASH CR	5440/12822	8	4.5	122	2500	1.3	4,300	9,754	0	60%	22.6	0.90	20.3	0.045
200	KLEANZA CR	5436/12822	8	9.2	92	1200	1.6	6,600	10,222	2	60%	34.7	0.90	31.2	0.031
201	MCKAY CR	5413/12825	8	4.9	152	2750	1.4	5,800	14,277	18	60%	30.5	0.90	27.4	0.049
202	SHAMES R	5425/12845	8	4.3	61	1320	1.3	2,100	5,440	15	60%	11.0	0.90	9.9	0.051
203	UNNAMED CR	5422/12854	8	2.2	122	2100	0.99	2,100	7,887	15	60%	11.0	0.90	9.9	0.075
204	WILLIAMS CR	5424/12825	8	7.5	61	1100	1.6	3,600	7,777	6	60%	18.9	0.90	17.0	0.043
205	ARDEN CR	5419/12941	9	1.2	336	750	0.55	3,200	7,996	16	70%	19.6	0.90	17.7	0.042
206	BROWN CR	5402/12950	9	6	107	500	1.1	5,000	6,512	3	72%	31.5	0.90	28.4	0.022
207	LIGNITE CR	5355/13237	9	4.7	61	1000	1.3	2,200	8,129	35	65%	12.5	0.90	11.3	0.068
208	MCDONALD CR	5407/12954	9	1.2	315	1900	0.64	3,000	5,993	0.5	70%	18.4	0.90	16.6	0.034
209	UNNAMED CR	5420/12946	9	0.7	397	800	0.45	2,200	6,329	16	70%	13.5	0.90	12.1	0.049
210	AMERICAN CR	5608/12954	11	5.1	91	1400	1.3	3,600	9,751	25	55%	17.3	0.90	15.6	0.059
211	KELSKIIST CR	5521/12942	11	3.4	183	1550	1	4,900	9,832	28	60%	25.8	0.90	23.2	0.040
212	KSHADIN CR	5527/12903	11	3	92	1150	1.1	2,200	8,603	6	60%	11.6	0.90	10.4	0.078
213	KWINATAHL R	5525/12908	11	6.8	123	1300	1.4	6,500	14,503	1	60%	34.2	0.90	30.7	0.044
214	MARMOT R	5553/13000	11	5.6	61	650	1.3	2,700	5,474	7	55%	13.0	0.90	11.7	0.044
215	SEASKINNISH CR	5516/12859	11	2.4	136	1750	0.97	2,600	6,284	2	60%	13.7	0.90	12.3	0.048
216	SEDAN CR	5505/12812	11	4.6	61	850	1.3	2,200	5,166	8	60%	11.6	0.90	10.4	0.047
217	UNNAMED CR	5521/12840	11	1.7	183	1750	0.8	2,400	10,480	30	50%	10.5	0.90	9.5	0.104
218	BEATTY CR	5806/13111	13	3.9	92	1370	1.2	2,800	10,594	17	45%	11.0	0.90	9.9	0.100
219	PINE CR DITCH	5935/13335	13	4.5	61	700	1.2	2,100	4,507	0.5	30%	5.5	0.90	5.0	0.085

TABLE 4.2a Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
1	BROWN CR	5402/12950	9	6	107	500	1.1	5,000	6,512	3	72%	31.5	0.90	28.4	0.022
2	CERVUS CR @ LADY F	4951/12547	3	5.5	100	380	1.1	4,300	5,121	1.6	65%	24.5	0.90	22.0	0.022
3	UNNAMED CR	4945/12331	2	5.5	122	350	1	5,300	5,633	6	55%	25.5	0.90	23.0	0.023
4	ZEBALLOS (LITTLE) R	4959/12645	3	1.5	210	750	0.64	2,500	3,385	6	65%	14.2	0.90	12.8	0.025
5	MILL CR	5224/12634	6	1.1	638	2200	0.56	5,500	7,841	1.5	65%	31.3	0.90	28.2	0.026
6	JOFFRE CR	4918/12235	2	3.8	190	900	0.96	5,700	7,136	10	57%	28.5	0.90	25.6	0.026
7	TIPELLA CR	4945/12210	2	4.9	90	300	0.99	3,500	4,510	0	55%	16.9	0.90	15.2	0.028
8	ROSEWALL C	4927/12448	3	2.9	100	630	0.91	2,300	3,368	1	62%	12.5	0.90	11.2	0.028
9	UNNAMED CR	4945/12327	2	0.88	550	1100	0.48	3,800	4,966	11	55%	18.3	0.90	16.5	0.028
10	PERKETTS CR	4953/12352	2	1.9	340	1000	0.68	5,100	6,979	15	55%	24.6	0.90	22.1	0.030
11	WEDGE CR	5010/12254	2	3.6	215	1500	1	6,100	9,166	2	60%	32.1	0.90	28.9	0.030
12	BOX CANYON CR	4935/12324	2	0.76	400	1400	0.5	2,400	3,332	2	55%	11.6	0.90	10.4	0.030
13	MAYNARD L	5024/12714	3	9.1	64	550	1.5	4,600	7,582	18	65%	26.2	0.90	23.6	0.030
14	KAIPIT CR	5015/12648	3	9.7	60	700	1.6	4,600	7,655	6	65%	26.2	0.90	23.6	0.030
15	THORNHILL CR	4940/12336	2	1.2	459	1250	0.57	4,300	6,065	0	55%	20.7	0.90	18.6	0.031
16	HANDY CR	4900/12456	3	3.8	100	310	0.89	3,000	4,771	29	62%	16.3	0.90	14.7	0.031
17	KLEANZA CR	5436/12822	8	9.2	92	1200	1.6	6,600	10,222	2	60%	34.7	0.90	31.2	0.031
18	TWENTYONE MILE CR	5007/12259	2	2.2	185	1000	0.8	3,200	4,965	1.5	60%	16.8	0.90	15.1	0.031
19	TSABLE R	4931/12454	3	6.8	50	500	1.4	2,700	4,626	4	65%	15.4	0.90	13.8	0.031
20	UNNAMED CR	4943/12345	2	1	427	1200	0.54	3,300	4,816	17	55%	15.9	0.90	14.3	0.032
21	FURRY CR	4935/12313	2	3.6	230	1600	1	6,500	9,858	6	57%	32.5	0.90	29.2	0.032
22	OWL CR	5022/12244	2	2.2	150	900	0.81	2,600	4,323	1	62%	14.1	0.90	12.7	0.032
23	BROWNS R# 1	4941/12509	3	5.9	50	400	1.2	2,300	4,041	2.1	65%	13.1	0.90	11.8	0.032
24	CACOOHTIN CR	5226/12619	6	1.7	214	1200	0.73	2,800	4,962	2	65%	15.9	0.90	14.3	0.032
25	MCGILLIVARY CR	5037/12226	2	1.2	350	1300	0.59	3,300	4,687	1	52%	15.0	0.90	13.5	0.033
26	SNOOTLI CR	5223/12636	6	2.2	152	1250	0.86	2,600	4,627	0.5	65%	14.8	0.90	13.3	0.033
27	GWILLIM CR	4945/11728	1	2.4	240	1100	0.8	4,500	5,597	1	45%	17.7	0.90	16.0	0.033
28	CHICKWAT CR	4949/12343	2	3.7	180	1050	0.98	5,200	7,982	27	55%	25.1	0.90	22.5	0.033
29	UNNAMED CR	4945/12343	2	1.5	214	600	0.62	2,500	3,866	18	55%	12.0	0.90	10.8	0.033
30	KOKISH R	5027/12647	3	5.2	127	1900	1.3	5,200	9,964	3	68%	31.0	0.90	27.9	0.034
31	UCONA R	4944/12557	3	6.6	50	200	1.1	2,600	4,771	10	65%	14.8	0.90	13.3	0.034
32	BEAR CR	4928/12146	2	1.6	365	2100	0.71	4,600	7,836	20	60%	24.2	0.90	21.8	0.034
33	THOMAS LAKE	4936/12225	2	1.1	520	1700	0.57	4,500	7,704	50	60%	23.7	0.90	21.3	0.034
34	MCDONALD CR	5407/12954	9	1.2	315	1900	0.64	3,000	5,993	0.5	70%	18.4	0.90	16.6	0.034
35	BIRKENHEAD R #1	5020/12243	2	23	30	200	2	5,400	9,715	1	63%	29.8	0.90	26.8	0.034
36	NOOKLIKONNIK CR	5222/12634	6	1.7	366	2400	0.75	4,900	9,145	2	65%	27.9	0.90	25.1	0.034
37	CRUICKSHANK CR	4936/12515	3	5.4	150	2000	1.3	6,300	11,809	18	65%	35.9	0.90	32.3	0.034
38	JANET CR	5223/12552	5	1	610	1950	0.53	4,800	9,015	32	65%	27.3	0.90	24.6	0.034
39	UNNAMED CR	5255/11853	4	2.6	184	330	0.71	3,700	5,373	11	50%	16.2	0.90	14.6	0.035

TABLE 4.2a Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
40	UNNAMED CR	5210/12650	6	3.2	152	1050	0.96	3,800	7,179	31	65%	21.6	0.90	19.5	0.035
41	COGBURN CR	4933/12145	2	5.9	100	1050	1.3	4,600	8,160	35	60%	24.2	0.90	21.8	0.035
42	SOUTH CRANBERRY CR	5046/11806	1	2.7	200	900	0.83	4,200	6,476	29	52%	19.1	0.90	17.2	0.035
43	CLAYTON FALLS CR	5222/12649	6	6.6	61	700	1.4	3,200	6,180	0	65%	18.2	0.90	16.4	0.035
44	HIGH CR	4955/12352	2	2.2	210	1000	0.77	3,600	5,907	21	55%	17.3	0.90	15.6	0.036
45	TEXAS CR	5034/12149	2	2.6	150	900	0.86	3,100	4,667	18	50%	13.6	0.90	12.2	0.036
46	UNNAMED CR	5057/11824	1	1.2	300	1100	0.59	2,800	3,796	6	45%	11.0	0.90	9.9	0.036
47	MAWBY CR	4953/12318	2	0.65	580	1150	0.44	3,000	4,999	2	55%	14.5	0.90	13.0	0.036
48	FISH HATCHERY CR	4936/12238	2	1.1	670	1600	0.53	5,800	9,834	50	55%	27.9	0.90	25.1	0.037
49	SPUZZUM CR	4939/12126	2	7.5	50	500	1.4	2,900	5,390	2	60%	15.2	0.90	13.7	0.037
50	SAUNDERS CR	4948/12601	3	3.1	90	1200	1.1	2,200	4,459	2	65%	12.5	0.90	11.3	0.037
51	THORSEN CR	5221/12642	6	6.1	80	1550	1.5	3,800	7,739	1	65%	21.6	0.90	19.5	0.037
52	LIZZIE CR	5012/12228	2	3.5	230	2000	1	6,300	11,273	11	57%	31.5	0.90	28.3	0.037
53	NICOAMEN CR	5016/12124	2	1.5	200	600	0.36	2,300	3,613	10	50%	10.1	0.90	9.1	0.037
54	TSEAPSEAHOOLZ CR	5226/12624	6	1.3	274	1900	0.68	2,800	5,722	0.5	65%	15.9	0.90	14.3	0.037
55	PIGGOTT CR	4949/12522	3	5.3	50	250	1.1	2,100	4,308	14	65%	12.0	0.90	10.8	0.038
56	BROWNS R# 2	4942/12508	3	6.4	50	750	1.4	2,500	5,133	2	65%	14.2	0.90	12.8	0.038
57	LOST VALLEY CR	5040/12218	2	0.94	350	1050	0.52	2,600	4,282	6	52%	11.8	0.90	10.7	0.038
58	GREY CR	4932/12345	2	3.6	95	700	1	2,700	4,705	8	55%	13.0	0.90	11.7	0.038
59	FRIES CR	4945/12309	2	1.6	180	1100	0.72	2,300	4,017	3	55%	11.1	0.90	10.0	0.038
60	SICAMOUS CR	5048/11858	1	1.6	200	1400	0.74	2,500	3,599	0	45%	9.9	0.90	8.9	0.038
61	ZEBALLOS R	5003/12647	3	5.6	60	800	1.3	2,600	5,458	10	65%	14.8	0.90	13.3	0.038
62	MOSHER CR	5225/12558	5	1.1	457	2400	0.6	3,900	8,222	32	65%	22.2	0.90	20.0	0.039
63	NEXT CR	4918/11645	1	3.6	120	1100	1.1	3,400	6,093	25	55%	16.4	0.90	14.7	0.039
64	UNNAMED CR	4946/12326	2	0.62	458	1100	0.45	2,200	3,955	14	55%	10.6	0.90	9.5	0.039
65	CAMERON R	4915/12440	3	6.2	50	250	1.2	2,400	4,339	9	55%	11.6	0.90	10.4	0.039
66	UNNAMED CR	5221/12640	6	0.4	1036	2700	0.41	3,200	6,848	0.5	65%	18.2	0.90	16.4	0.039
67	NOOMST CR #1	5223/12615	6	1.3	427	2950	0.69	4,300	9,226	7	65%	24.5	0.90	22.0	0.039
68	UNNAMED CR	5254/11846	4	2.5	152	520	0.77	3,000	4,968	24	50%	13.1	0.90	11.8	0.039
69	MONMOUTH CR	4943/12311	2	0.59	470	1000	0.44	2,200	4,010	3	55%	10.6	0.90	9.5	0.039
70	MCNAIR CR	4931/12330	2	2.1	180	1600	0.86	3,000	5,470	1	55%	14.5	0.90	13.0	0.039
71	ZEBALLOS L	5003/12646	3	5.4	90	1250	1.3	3,800	8,202	10	65%	21.6	0.90	19.5	0.040
72	UNNAMED CR	5001/12321	2	1.8	275	700	0.64	3,900	7,158	15	55%	18.8	0.90	16.9	0.040
73	CLINT CR	5013/11654	1	2.4	243	2000	0.89	4,600	7,684	1	50%	20.1	0.90	18.1	0.040
74	STAWAMUS CR	4942/12307	2	2.8	274	2650	0.97	6,000	11,029	3	55%	28.9	0.90	26.0	0.040
75	KELSKIIST CR	5521/12942	11	3.4	183	1550	1	4,900	9,832	28	60%	25.8	0.90	23.2	0.040
76	HADOW CR	5040/11748	1	1.4	400	950	0.59	4,400	7,831	41	53%	20.4	0.90	18.4	0.040
77	SHAW CR	4915/11643	1	1.1	240	1000	0.59	2,100	3,879	21	55%	10.1	0.90	9.1	0.040
78	CASCADE CR	5025/11707	1	1.9	180	1800	0.84	2,700	5,275	14.5	57%	13.5	0.90	12.1	0.041

TABLE 4.2a Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
79	RED TUSK CR	4947/12325	2	2.6	180	1400	0.9	3,700	6,977	13	55%	17.8	0.90	16.0	0.041
80	UNNAMED CR	4947/12334	2	1.4	457	1200	0.6	5,000	9,471	17	55%	24.1	0.90	21.7	0.041
81	MASELPANIK CR	4907/12115	2	2.3	300	2500	0.88	5,400	11,741	37	63%	29.8	0.90	26.8	0.041
82	LASCA CR	4936/11709	1	1.5	300	2100	0.72	3,500	5,460	1	45%	13.8	0.90	12.4	0.041
83	TOMMY CR	5050/12231	2	1.2	300	1800	0.64	2,800	5,074	20	52%	12.8	0.90	11.5	0.041
84	BEATRICE CR	4950/11728	1	4.1	165	750	0.98	5,300	8,363	7	45%	20.9	0.90	18.8	0.042
85	AIRPLANE CR	4908/12137	2	0.9	300	1400	0.56	2,100	4,646	7	63%	11.6	0.90	10.4	0.042
86	TANTALUS CR	4951/12315	2	0.9	762	3000	0.45	5,400	10,436	2	55%	26.0	0.90	23.4	0.042
87	MULVEHILL CR	5051/11807	1	1.9	150	550	0.7	2,200	3,515	17	45%	8.7	0.90	7.8	0.042
88	THELWOOD CR	4933/12534	3	2.9	100	1000	1	2,300	5,314	41	65%	13.1	0.90	11.8	0.042
89	YARD CR	5054/11848	1	3.1	150	1550	1	3,600	5,767	0	45%	14.2	0.90	12.8	0.042
90	CARIBOU CR	4959/11750	1	6.1	120	1350	1.3	5,700	9,142	2.5	45%	22.5	0.90	20.2	0.042
91	ARDEN CR	5419/12941	9	1.2	336	750	0.55	3,200	7,996	16	70%	19.6	0.90	17.7	0.042
92	UNNAMED CR	4955/12348	2	0.88	579	3000	0.56	4,000	7,884	25	55%	19.3	0.90	17.3	0.043
93	TSUIUS CR	5037/11840	1	5	150	1650	1.2	5,900	9,968	7	47%	24.3	0.90	21.9	0.043
94	SOWERBY CR	4919/12126	2	1.4	425	3400	0.71	4,700	10,653	7	63%	25.9	0.90	23.3	0.043
95	WILLIAMS CR	5424/12825	8	7.5	61	1100	1.6	3,600	7,777	6	60%	18.9	0.90	17.0	0.043
96	WILSON CR	4935/11652	1	0.58	609	2700	0.47	2,800	5,547	12	55%	13.5	0.90	12.1	0.043
97	UNNAMED CR	4949/12323	2	0.38	793	1150	0.36	2,400	4,757	17	55%	11.6	0.90	10.4	0.043
98	RAINY R	4932/12330	2	7	60	800	1.5	3,300	6,541	3	55%	15.9	0.90	14.3	0.043
99	UNNAMED CR	4946/12541	3	2.5	200	1060	0.83	3,900	9,138	20	65%	22.2	0.90	20.0	0.043
100	CRAWFORD CR	5045/11759	1	1.1	250	1300	0.61	2,200	4,207	21	53%	10.2	0.90	9.2	0.043
101	NORDSCHOW CR	5218/12603	6	2.9	183	1500	0.95	4,200	9,878	20	65%	23.9	0.90	21.5	0.043
102	SALMON R	5005/12641	3	7.5	50	700	1.5	2,900	7,049	19	67%	17.0	0.90	15.3	0.043
103	CLEMINA CR	5234/11905	4	2.5	152	1300	0.9	3,000	5,458	10	50%	13.1	0.90	11.8	0.043
104	CLOWHOM R	4949/12323	2	7.8	60	400	1.3	3,700	7,430	19	55%	17.8	0.90	16.0	0.043
105	MCDONALD CR	5034/11625	1	1.8	250	1100	0.71	3,500	6,652	36	52%	15.9	0.90	14.3	0.044
106	UNNAMED CR	4948/12324	2	0.8	793	2700	0.49	5,000	10,111	15	55%	24.1	0.90	21.7	0.044
107	MAQUILLA CR	5005/12625	3	3.4	90	1650	1.2	2,400	5,649	0.8	64%	13.5	0.90	12.1	0.044
108	MARMOT R	5553/13000	11	5.6	61	650	1.3	2,700	5,474	7	55%	13.0	0.90	11.7	0.044
109	KOKISH R	5028/12648	3	5.5	60	1400	1.5	2,600	6,523	2.8	68%	15.5	0.90	13.9	0.044
110	KWINATAHL R	5525/12908	11	6.8	123	1300	1.4	6,500	14,503	1	60%	34.2	0.90	30.7	0.044
111	KOKISH R	5029/12650	3	17	30	950	2.4	4,000	10,132	0.7	68%	23.8	0.90	21.4	0.044
112	FOSTHALL CR	5022/11757	1	8.8	60	225	1.3	4,100	7,197	34	47%	16.9	0.90	15.2	0.044
113	SHANNON CR	5005/11729	1	1.5	180	1700	0.76	2,100	3,696	2	47%	8.6	0.90	7.8	0.045
114	ROARING CR	4927/12213	2	1.4	200	900	0.65	2,200	4,538	25	55%	10.6	0.90	9.5	0.045
115	LYNN CR	4921/12301	2	4	75	1800	1.3	2,300	4,755	0	55%	11.1	0.90	10.0	0.045
116	WEE SANDY CR	5000/11725	1	1.8	180	900	0.72	2,500	4,430	10	47%	10.3	0.90	9.3	0.045
117	CHIMDEMASH CR	5440/12822	8	4.5	122	2500	1.3	4,300	9,754	0	60%	22.6	0.90	20.3	0.045

TABLE 4.2a Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
118	LAKE LOVELY WATER	4948/12313	2	0.75	1100	3400	0.48	6,500	14,771	9	60%	34.2	0.90	30.7	0.045
119	GOLD R	4952/12606	3	20	30	900	2.5	4,700	11,664	4.4	65%	26.8	0.90	24.1	0.045
120	SIWASH CR	4934/12124	2	3	200	600	0.81	4,700	8,989	12	50%	20.6	0.90	18.5	0.046
121	WILSON CR FALLS	5008/11720	1	9.2	60	550	1.5	4,300	7,809	11	47%	17.7	0.90	15.9	0.046
122	BONANZA R	5020/12644	3	4.4	60	1400	1.4	2,100	5,554	0.8	68%	12.5	0.90	11.3	0.046
123	MCLENNAN R @ S.ARM	5251/11921	4	1.4	244	1450	0.69	2,700	5,270	6	50%	11.8	0.90	10.6	0.046
124	CLOWHOM R	4950/12329	2	1.7	320	600	0.6	4,300	9,249	27	55%	20.7	0.90	18.6	0.047
125	SEDAN CR	5505/12812	11	4.6	61	850	1.3	2,200	5,166	8	60%	11.6	0.90	10.4	0.047
126	UNNAMED CR	5059/11645	1	0.72	400	1100	0.47	2,300	4,760	34	52%	10.5	0.90	9.4	0.047
127	MONTAGUE CR	5020/12612	3	2.2	152	1500	0.9	2,600	6,625	22	64%	14.6	0.90	13.1	0.047
128	SMITELY R @ FALLS	5205/12636	6	18.6	31	450	2.1	4,500	11,693	56	65%	25.6	0.90	23.1	0.048
129	VANCOUVER CR	4956/12348	2	8.1	60	900	1.6	3,800	8,393	25	55%	18.3	0.90	16.5	0.048
130	UNNAMED CR	4957/12150	2	2.3	250	1500	0.83	4,500	8,500	28	47%	18.5	0.90	16.7	0.048
131	GRANT BROOK	5254/11845	4	3.9	152	1500	1.1	4,600	9,248	21	50%	20.1	0.90	18.1	0.048
132	EAST CR #2	5039/11701	1	7	100	1150	1.4	5,500	11,726	45	53%	25.5	0.90	23.0	0.048
133	SEASKINNISH CR	5516/12859	11	2.4	136	1750	0.97	2,600	6,284	2	60%	13.7	0.90	12.3	0.048
134	SWIFTCURRENT CR	5301/11917	7	5.8	61	800	1.4	2,800	5,640	0.5	50%	12.3	0.90	11.0	0.048
135	GOLD CR	4921/12227	2	5.3	50	250	1.1	2,100	4,675	16	55%	10.1	0.90	9.1	0.048
136	UNNAMED CR	4950/12131	2	2	300	2200	0.82	4,700	8,972	9	47%	19.4	0.90	17.4	0.048
137	DORE CR #1	5316/12017	7	6.8	92	1600	1.5	4,900	9,958	13	50%	21.5	0.90	19.3	0.048
138	CULTUS CR	4920/11647	1	3.9	123	1800	1.2	3,800	8,525	27	55%	18.3	0.90	16.5	0.049
139	LATEWHOS CR	5027/11843	1	0.65	450	2600	0.51	2,300	4,224	8	45%	9.1	0.90	8.2	0.049
140	COOKE CR	5037/11850	1	1.9	200	2100	0.86	3,000	5,521	0.5	45%	11.8	0.90	10.6	0.049
141	SCUZZZY CR	4949/12128	2	7.9	70	1100	1.6	4,300	8,268	3	47%	17.7	0.90	15.9	0.049
142	MCKAY CR	5413/12825	8	4.9	152	2750	1.4	5,800	14,277	18	60%	30.5	0.90	27.4	0.049
143	UNNAMED CR	5420/12946	9	0.7	397	800	0.45	2,200	6,329	16	70%	13.5	0.90	12.1	0.049
144	SANCA CR	4923/11643	1	2.3	120	1000	0.88	2,200	4,973	25	55%	10.6	0.90	9.5	0.049
145	DAVE HENRY CR #2	5245/11905	4	3.5	91	550	0.97	2,500	5,156	11	50%	11.0	0.90	9.9	0.049
146	BEATTON CR	5044/11744	1	2.8	150	2000	1	3,300	8,615	50	63%	18.2	0.90	16.4	0.049
147	ROBSON R	5303/11913	7	6.1	61	1050	1.5	2,900	6,218	2.5	50%	12.7	0.90	11.4	0.051
148	SHAMES R	5425/12845	8	4.3	61	1320	1.3	2,100	5,440	15	60%	11.0	0.90	9.9	0.051
149	MOAKWA CR	5007/12602	3	3.1	90	1250	1.1	2,200	6,124	22	64%	12.3	0.90	11.1	0.052
150	TSILEUH CR	4946/12126	2	0.87	700	3900	0.57	4,800	9,842	5	47%	19.8	0.90	17.8	0.052
151	HALFWAY HOTSPRINGS	5029/11751	1	13	60	1300	2	6,100	12,510	22	47%	25.1	0.90	22.6	0.052
152	DERRY CR	5046/11833	1	1.3	300	2350	0.71	3,100	6,130	22	45%	12.2	0.90	11.0	0.052
153	CONNEL CR	5039/12225	2	0.65	950	3800	0.48	4,800	11,068	0.5	52%	21.9	0.90	19.7	0.053
154	TLATLOS CR	5023/12614	3	2.1	182	2275	0.92	3,000	8,577	26	64%	16.8	0.90	15.1	0.053
155	CAYOOSH CR #2	5039/12159	2	21	30	800	2.5	4,900	11,734	4	53%	22.7	0.90	20.5	0.054
156	TAM O'SHANTER CR	4948/11651	1	0.96	490	3000	0.6	3,700	7,529	10	45%	14.6	0.90	13.1	0.054

TABLE 4.2a Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
157	CANTELON/YOLA CR	4913/12123	2	3	105	2000	1.1	2,500	7,135	22	63%	13.8	0.90	12.4	0.054
158	UNNAMED CR	4909/12120	2	1.2	243	2100	0.69	2,300	6,593	30	63%	12.7	0.90	11.4	0.054
159	SOUTH ENGLISHMAN R	4915/12417	3	4.6	100	2000	1.3	3,600	9,037	5	55%	17.3	0.90	15.6	0.054
160	POWDER CR	4953/11651	1	1.4	370	2500	0.7	4,100	8,458	23	45%	16.2	0.90	14.5	0.055
161	HORSEY CR	5308/11941	7	5.9	122	2050	1.4	5,600	12,878	14	50%	24.5	0.90	22.1	0.055
162	TLUPANA R	4946/12620	3	2.9	90	1850	1.1	2,000	6,004	2	65%	11.4	0.90	10.2	0.055
163	CLUTE CR	5001/11653	1	0.81	609	3200	0.55	3,900	9,017	8	50%	17.1	0.90	15.4	0.055
164	WOODBURY CR	4948/11657	1	1.9	300	3900	0.9	4,500	11,461	6	55%	21.7	0.90	19.5	0.055
165	EAST CR #1	5039/11702	1	7	50	500	1.4	2,700	6,667	42	53%	12.5	0.90	11.3	0.055
166	UNNAMED CR	4940/12151	2	0.65	540	2000	0.47	2,700	7,578	55	60%	14.2	0.90	12.8	0.056
167	ENGLISHMAN CR	4915/12421	3	10	50	1630	2	3,900	10,074	2.3	55%	18.8	0.90	16.9	0.056
168	GIEGERICH CR	5043/11707	1	4.6	100	1100	1.2	3,600	8,970	55	53%	16.7	0.90	15.0	0.056
169	RAPID CR	5027/11710	1	1.2	300	2400	0.67	2,800	6,196	21	47%	11.5	0.90	10.4	0.056
170	PINDER CR	5015/12655	3	3	90	2100	1.2	2,100	6,444	16	65%	12.0	0.90	10.8	0.056
171	GHITA CR	5251/11839	4	2.7	306	2750	0.94	6,500	15,392	31	50%	28.5	0.90	25.6	0.056
172	WARREN CR	5058/11642	1	1.4	550	3400	0.69	6,000	14,891	30	52%	27.3	0.90	24.6	0.057
173	LOKI CR	4950/11651	1	0.87	430	2400	0.57	2,900	6,278	14	45%	11.4	0.90	10.3	0.057
174	PHILLIPS CR	4940/12534	3	8	50	500	1.5	3,100	9,749	27	65%	17.7	0.90	15.9	0.058
175	DORE CR #2	5313/12017	7	5.2	91	1500	1.4	3,700	8,963	17	50%	16.2	0.90	14.6	0.058
176	CLOWHOM R	4951/12327	2	3.6	120	1000	1	3,400	9,079	25	55%	16.4	0.90	14.7	0.058
177	TZOONIE CR	4947/12343	2	11	30	320	1.7	2,600	7,003	23	55%	12.5	0.90	11.3	0.058
178	AMERICAN CR	5608/12954	11	5.1	91	1400	1.3	3,600	9,751	25	55%	17.3	0.90	15.6	0.059
179	BERNARD CR	4952/11651	1	1.7	180	1200	0.75	2,400	5,323	20	45%	9.5	0.90	8.5	0.059
180	ALLAN CR	5232/11907	4	4.3	91	1900	1.3	3,100	7,643	12	50%	13.6	0.90	12.2	0.059
181	SMALL CR	5304/11935	7	9.1	61	1400	1.8	4,300	10,800	7	50%	18.8	0.90	17.0	0.060
182	WRAGGE CR	5004/11728	1	1.1	244	1800	0.66	2,100	4,747	2	45%	8.3	0.90	7.5	0.060
183	BULLDOG CR	5239/11859	4	3.6	152	875	0.97	4,300	10,910	26	50%	18.8	0.90	17.0	0.060
184	TENDERFOOT CR	5028/11713	1	1.5	240	2500	0.78	2,800	6,753	28	47%	11.5	0.90	10.4	0.061
185	SWIFT CR #1	5252/11913	4	3.3	91	1325	1.1	2,400	6,178	5	50%	10.5	0.90	9.5	0.061
186	BOYD CR	5053/11734	1	2.2	250	1800	0.84	4,300	11,870	64	53%	20.0	0.90	18.0	0.062
187	SALLOOMT CR	5227/12632	6	8.6	31	850	1.8	2,100	7,114	7	65%	12.0	0.90	10.8	0.062
188	CATHERINE CR	5025/12636	3	3	90	1100	1	2,100	7,563	19	68%	12.5	0.90	11.3	0.063
189	CAMPBELL CR	4957/11651	1	2.7	240	2400	0.97	5,100	12,247	28	45%	20.1	0.90	18.1	0.064
190	KELLIE CR	5055/11734	1	1.8	250	1150	0.71	3,500	10,099	65	53%	16.2	0.90	14.6	0.065
191	KUNNUM CR	5018/12614	3	2.9	91	2050	1.2	2,100	7,513	27	64%	11.8	0.90	10.6	0.067
192	FITZSTUBBS CR	5009/11722	1	11	60	2000	2.1	5,200	13,741	13	47%	21.4	0.90	19.3	0.067
193	MARBLE R CANYON	5026/12723	3	11	33	1700	2.2	2,800	11,136	5	70%	17.2	0.90	15.5	0.068
194	LIGNITE CR	5355/13237	9	4.7	61	1000	1.3	2,200	8,129	35	65%	12.5	0.90	11.3	0.068
195	BOLTON CR	5413/12826	8	4.8	61	1050	1.3	2,300	7,845	18	60%	12.1	0.90	10.9	0.068

TABLE 4.2a Inventory of Small Hydro Sites (greater than 2 MW and less than 5 MW)

No.	Stream Name *SORTED: by cost*	Lat/Long	Region	Flow (m^3/s)	Head (m)	Penstock L(m)	Penstock D(m)	Power (kW)	**Cost** ($1000)	Transm. Dist.(km)	Capacity Factor	Energy (GWh)	fish flow factor	**'Green' Energy** (GWh)	**Cost** $/kWh
196	ASHER CR	5036/11729	1	3.4	150	2100	1.1	4,000	12,181	54	53%	18.6	0.90	16.7	0.068
197	BRENNER CR	5013/11730	1	3.5	120	1900	1.2	3,300	8,919	26	47%	13.6	0.90	12.2	0.068
198	POPLAR CR	5026/11708	1	4.2	120	2700	1.3	3,900	10,575	17	47%	16.1	0.90	14.5	0.069
199	MYRA CR AT FALLS	4935/12534	3	5.3	50	1200	1.5	2,100	7,919	40	65%	12.0	0.90	10.8	0.069
200	MCDOUGAL CR	5058/11737	1	3.4	150	850	0.95	4,000	12,334	80	53%	18.6	0.90	16.7	0.069
201	PTARMIGAN CR	5235/11850	4	9.5	61	1600	1.8	4,500	13,136	40	50%	19.7	0.90	17.7	0.070
202	LAIDLAW CR	5052/11714	1	2.2	150	1400	0.88	2,600	8,083	73	53%	12.1	0.90	10.9	0.070
203	MCNULTY CR	4925/12005	2	1.3	250	1900	0.69	2,500	5,875	10	40%	8.8	0.90	7.9	0.070
204	UNNAMED CR	5310/12002	7	0.5	549	1700	0.41	2,100	6,236	18	50%	9.2	0.90	8.3	0.071
205	HELLROARER CR	4935/11845	1	0.71	400	1750	0.5	2,200	5,459	30	40%	7.7	0.90	6.9	0.074
206	STIKELAN CR #2	5127/12422	5	3.3	91	900	1	2,400	6,732	25	45%	9.5	0.90	8.5	0.074
207	UNNAMED CR	5422/12854	8	2.2	122	2100	0.99	2,100	7,887	15	60%	11.0	0.90	9.9	0.075
208	DIORITE CR	4958/11540	1	1.3	490	4100	0.72	5,000	12,906	2	40%	17.5	0.90	15.8	0.077
209	KSHADIN CR	5527/12903	11	3	92	1150	1.1	2,200	8,603	6	60%	11.6	0.90	10.4	0.078
210	ADOLPH CR #1	5231/11923	4	2.8	213	3400	1.1	4,700	15,390	29	50%	20.6	0.90	18.5	0.078
211	UNNAMED CR	5308/12001	7	0.9	335	1300	0.55	2,400	7,875	23	50%	10.5	0.90	9.5	0.078
212	COOPER CR	5012/11659	1	4.6	183	5100	1.4	6,600	21,728	1.5	47%	27.2	0.90	24.5	0.083
213	PINE CR DITCH	5935/13335	13	4.5	61	700	1.2	2,100	4,507	0.5	30%	5.5	0.90	5.0	0.085
214	VOWELL CR	5053/11652	1	5.9	50	800	1.4	2,300	8,743	50	52%	10.5	0.90	9.4	0.087
215	COCHRANE CR	4940/11844	1	0.53	500	2600	0.47	2,100	6,863	45	40%	7.4	0.90	6.6	0.097
216	BEATTY CR	5806/13111	13	3.9	92	1370	1.2	2,800	10,594	17	45%	11.0	0.90	9.9	0.100
217	UNNAMED CR	5521/12840	11	1.7	183	1750	0.8	2,400	10,480	30	50%	10.5	0.90	9.5	0.104
218	UNNAMED CR	5126/12445	5	1.1	336	1350	0.58	2,900	13,355	60	50%	12.7	0.90	11.4	0.110
219	UNNAMED CR	5321/11951	7	1.3	274	2000	0.69	2,800	13,742	32	50%	12.3	0.90	11.0	0.117

5. LITERATURE REVIEW

A literature review conducted as part of the study for the Handbook and most of the information was considered relevant for the development of new micro hydro sites. Additional information may be found in the Handbook on the use of the information.

HANDBOOK FOR MICRO HYDRO DEVELOPMENT IN BRITISH COLUMBIA

REFERENCE LIST

BC Government Acts & Associated Publications

Interpretation Act [RSBC 1996]. Chapter 238
Definition of terms used in RSBC Acts
http://www.qp.gov.bc.ca/bcstats/96238_01.htm

Fish Protection Act: Objectives, highlights and initiatives of the new Act before parliament
http://www.env.gov.bc.ca/wat/wrs/fsh/protection_act

Fish Protection Act (First Reading) [Bill 25-1997]
http://www.legis.gov.bc.ca/1997/1st_read/gove25-1.htm

Water Act [RSBC 1996]. 26p.
Unofficial copy of the legislation.
http://bbs.qp.gov.bc.ca/bcstats/96483_01.htm

Water Protection Act [RSBC 1996]. Chapter 484.
http://qp.gov.bc.ca/bcstats/96484_01.htm

Water Protection in British Columbia
http://www.env.gov.bc.ca/wat/wrs/protect.html

Water Regulation in British Columbia
http://www.env.gov.bc.ca/wat/wrs/waterreg/01.htm

Water Rights in British Columbia
Includes information on water licenses, rights and obligations of users
http://www.elp.gov.bc.ca/wat/wrs/rightsbc.html

Water Rights & Obligations
http://www.elp.gov.bc.ca/wat/wrs/rights.html

Water Rights Information, Research and Copy Charges
Includes charges for copies of the official version of the *Water Act* and *The Water Protection Act*
http://www.elp.gov.bc.ca/wat/wrs/fs4copy.htm

How to Apply for a Water License
http://www.elp.gov.bc.ca/wat/wrs/apply

HANDBOOKS & MANUALS

Canada. Department of Energy, Mines and Resources. (1980**). *Micro Hydro. Volume 1: A Survey of Potential Micro Hydro Developments for use by Remote Communities in British Columbia.*** [Report ER-809E].
Presents the results of a study to estimate micro hydro potential in remote locations of British Columbia, not served at the time of publication by BC Hydro. The province was divided into 10 regions according to major physical and climatic variations. Sub-areas represent each of the regions on the basis of population, energy demand, topography and potential water availability established from iso-flow lines.

Canada. Department of Energy, Mines and Resources. (1980). ***Micro Hydro. Volume 2: Guidance Manual of procedures for Assessment of Micro Hydro Potential.*** Energy Mines and Resources Canada, Ottawa. [Report ER-809E].
This manual presents procedures for the assessment of actual sites for micro hydro development. It provides direction and a step-by-step procedure for a prefeasibility level investigation from initial map studies through to preliminary site layout cost estimates, economic and financial evaluation. A case study is included.

Canada. Department of Energy, Mines and Resources. ***Small Hydropower Handbook for British Columbia.*** (1986*).* Energy, Mines and Resources Canada & Conservation and Renewable Energy Office, BC., Ottawa.
A detailed manual to assist people interested in developing a small hydro opportunity on sites which do not justify the expense of extensive professional engineering services. It does not assume any previous acquaintance with the subject. Sections focus on feasibility assessment; site exploration and layout; civil works and equipment required; permits, licenses and legal aspects; economics and financing; selection and installation of equipment; operation and maintenance information. Low Head and Cold Weather Considerations are discussed in specialized appendices. The emphasis is on providing an understanding to allow users to do as much as possible themselves, with minimal capital costs.

Canada, Department of Energy, Mines and Resources. (1986, 1989, 1990). ***Small Hydro Sites and Potential Sites in British Columbia.***
A comprehensive listing of these sites, with information relevant to their potential for hydro development.

Commission of the European Communities. Directorate General for Energy. European Small Hydro Association.(1990). ***Layman's Guidebook on How to Develop a Small Hydro Site.*** European Small Hydro Association, Brussels. Part I: 73p. Part II: 111p.
Part I addresses non-technical readers with a general introduction, followed by chapters on economic analysis and environmental mitigation. Part II is written for non-experts, but presupposes a technical understanding of engineering terms, formulae and procedures. Three sections cover the potential of water resources, civil engineering works and electro-mechanical equipment.

Curtis, D., Langley, W. & Ramsey, R. (1999). ***Going With the Flow: Small Scale Water Power Made Easy.*** Maya Books, Twickenham, UK. 160p.
Although written for schemes less than 100kW, this recent guide is also intended to give useful information to the reader generally interested in small hydro schemes. Coverage includes components, site assessment, system design, economics, installation, electrical aspects, and maintenance. Case studies are presented.

Fraenkel, Peter *et al*. (1991). ***Micro-hydro Power: A Guide for Development Workers.*** Intermediate Technology Publications, London.160p.
Still in print, this is a comprehensive guide for the non-specialist.

Harvey Adam et al. (1998*).* ***Micro-hydro Design Manual: Guide to Small-scale Water Schemes.*** Intermediate Technology , London. 374p.
New edition of an established guide, available from CISTI, written to give quick and reliable methods of planning a scheme, assessing viability, and sizing and selecting components. Sections include major components, civil works, hydrology, financial evaluation and commissioning and testing. The manual provides worked examples throughout so that financial and engineering calculations can be followed in detail.

Independent Power Producers of Ontario (IPPSO). (2000). ***Canadian Power Directory 2000***. IPPSO, Toronto, Ont. 331p.
Reference guide to Canadian project developers, equipment and service suppliers, financiers, associations, government agencies, consultants as other resources. Available from IPPSO.

Sigma Engineering. (1983). ***Small-Hydro Power Resource in the Provincial System.*** Ministry of Energy, Mines & Petroleum Resources, British Columbia. 2 Vols. Vol I: *Technology and Resource Assessment*. Vol II: *Economic and Financial Assessment.*
Provides guidelines for developing small hydro sites from a technical and regulatory viewpoint, and a step-by-step guide for establishing preliminary designs and costs. 665 potential small hydro sites in BC, including those suitable for micro schemes, are identified.

SUBJECT SPECIFIC REFERENCES
Agreements to Purchase Electricity

Connection to Utility Distribution Systems

Canadian Electrical Association. (1994). ***Connecting Small Generators to Utility Distribution Systems. Draft Report***. CEA, Montreal, Q. [CEA 128-D-767].

BC Hydro. Customer Services. Distribution Planning & Automation Department. Engineering & Technical Services Division. (1994). ***BC Hydro Connection Requirements for Non-Utility Generation, 35KV and Below.*** BC Hydro, Vancouver, BC. 36p.

Dams

United States Department of the Interior. Bureau of Reclamation. 3rd ed. (1987). ***Design of Small Dams.*** Bureau of Reclamation, Denver. 860p.
Definitive text on the planning, design, construction, operation and evaluation of small dams up to 200' high. Major sections on spillways and outlet works, ecological and environmental considerations, flood hydrology, construction and hydraulic computations.

Design (General)

American Society of Civil Engineers. Energy Division. (1989). ***Civil Engineering Guidelines for Planning and Designing Hydroelectric Developments. Volume 4: Small Scale Hydro.*** American Society of Civil Engineers, New York, NY.
Intended for use by civil engineers in conjunction with the *Conventional Guidelines* also published by ASCE, these guidelines give an insight into problems and solutions related to all aspects of small hydro projects. Particular emphasis on the need for evaluation, planning, and design considerations.

Koch, C. P. (1990). ***Small hydroelectric design manual.*** C.P. Koch, New Westminster, BC. 29p.
Written to help with design calculations which are essential before practical aspects of a project can be considered.

Shawinigan Consultants. (1983). ***Methodology for the Design and Costing of Small Hydro Plants.*** Canadian Electrical Association, Montreal, Q. 247p.
A useful manual, which presents a simplified methodology intended for project assessments at the site identification and reconnaissance levels. The six sections include layout options, technical considerations, cost estimates and project evaluation.

Economics and Financing

BC Hydro. Resource Planning. (1991). ***Financial Evaluation Guide for Private Power Projects***. BC Hydro, Vancouver, BC. 35p.
Explains the different components of electricity, types of costs, and factors affecting costs, and provides a guide to calculating a project's potential value.

Ontario. Ministry of Energy. (1986). ***Small Hydro '86. Proceedings. March 5-6, 1986***.
Conference papers dealing with municipal and private micro projects, with a focus on economics and financing. Largely dealing with Ontario and Quebec, but much is of general applicability.

Sigma Engineering. (1983). ***Small-Hydro Power Resource in the Provincial System***. **Vol II: *Economic and Financial Assessment.*** Ministry of Energy, Mines & Petroleum Resources, British Columbia.
Provides a step-by-step guide for establishing preliminary designs and costs.

Tudor Engineering Company. (1983). ***Simplified Methodology for Economic Screening of Potential Small-Capacity Hydroelectric Sites.*** Electric Power Research Institute, Palo Alto, CA.
A step-by-step guide for users with limited technical background to estimate the power and energy output, and project costs for a potential site, and to perform preliminary economic analysis. Appendices discuss engineering design and layout, equipment, and hydrology and data collection methodology and evaluation.

Electrical Safety

Electrical Industry Training Institute. (1997). ***High Voltage Substation Electrical Awareness***. EITI, Surrey, BC. 50p.
Safety manual written for electrical workers in BC, with sections on electricity, safety equipment, substation equipment, working distances, safety grounding and station inspection.

Electrical Industry Training Institute. (1998). ***High Voltage Substation Electrical Awareness for Non-Electrical Workers***. EITI, Surrey, BC. 17p
Supplement to the above publication.

Environmental

Environmental & Social Systems Analysts (1991). ***Small Hydro Environmental Handbook.*** Canadian Electrical Association, Montreal, Q. [CEA 950 G 741].126p.
This handbook describes three aspects of the environmental and regulatory planning of small hydro developments: government regulatory approval processes, recommended steps in the environmental planning of a project, and a detailed environmental screening process. Answers to the questions addressed will provide readers with the basis for initial contacts with provincial and municipal government representatives.

Ottawa Engineering Ltd. (1992). ***Environmental Aspects of Small Hydro Projects.***

N.B. See also listings for BC Government Acts and Associated Publications.

Equipment (see also Generators, Pumps as Turbines, Turbines)

Hulscher, Wim & Fraenkel, Peter. (1994). ***The Power Guide: An International Catalog of Small-Scale Energy***. Stylus Pub, Hendon,VA. 240p.

Mathews, Robert. 7th ed. (1998). ***Energy Alternatives Design Guide & Catalogue*****.** Energy Alternatives, Chase, BC. 40p.

Explanations, advice and guidance for do-it-yourself developers of the lower range of micro hydro schemes, complement a catalogue of relevant equipment.

Feasibility Studies

Fritz, Jack J. (1984). ***Small & Mini Hydro Systems: Resource Assessment & Project Feasibility***. McGraw-Hill, New York. 300p.
Technical manual and guidebook consisting of a collection of technical papers by different experts on hydrology, turbine design, generators and electrical equipment, dams, site design, economics and environmental considerations. Includes a comprehensive chapter on feasibility with examples and case studies.

Lanmer Consultants Ltd. (1982*).* ***Considerations for Small Hydro Developments in Off-Grid Locations*****.** Energy, Mines and Resources Canada, Ottawa, Ont.

Ontario. Ministry of Energy. (1986*).* ***Streams of Power: Developing Small Scale Hydro Systems****.* Renewable Energy in Canada, Toronto, Ont. 107p.
Small handbook covering the basic issues and considerations in planning a micro hydro system and a step-by-step guide to making a preliminary feasibility analysis and options available for developing a site.

Canada. Department of Natural Resources. ***RETScreen*** [Software]**.** NRCAN, Ottawa, Ont.
Downloadable Renewable Energy Project Analysis Software, developed by the Government of Canada through the CANMET Energy Diversification Research Laboratory (CEDRL) of Natural Resources Canada. The RETScreen Small Hydro Model is based on twenty years of data and can be used to evaluate micro hydro projects using worksheets to carry out an energy model, a cost analysis and a financial summary. A hydrology worksheet is also provided.
See *Useful Websites-Canadian* for the website address.

U.S. Department Of Energy. Hydrologic Engineering Center & The Institute for Water Resources. (1979*).****Feasibility studies for small scale hydropower additions: a guide manual.*** US Army Corps of Engineers, Ft. Belvoir, VA.
An extensive, but readable, manual providing technical data and procedural guidance for the systematic appraisal of the viability of potential small hydropower additions to existing facilities. With emphasis on the need for detailed planning studies, six sections focus on concepts and technology, economic and financial issues, hydrologic studies, existing facility integrity in relation to dam safety, and electromechanical and civil considerations. Two case studies are used to test the manual and to illustrate the application of its data.

Generators

Smith, Nigel. (1994). ***Motors As Generators for Micro-Hydro Power****.* Stylus Pub VA. 82p*.*
This practical handbook, which is still in print and available from CISTI and Stylus Publishing, is a guide to the use of induction motors for electricity generation in remote locations. It is based on the practical experience of manufacturers and installers of induction generator units working in a number of countries.

Hydraulics

Chow, Ven Te. (1981). ***Open Channel Hydraulics*****.** McGraw-Hill, New York, NY.
An engineering text which aims to bridge the gap between theory and practice with a simplified explanation of hydraulic theory, and a minimal use of advanced mathematics.
Sections include basic energy and momentum principles, design of channels, an analysis of various types of flow, spillways, surges and practical problems related to transitions.

Parmakian, John. (1963). ***Waterhammer Analysis*****.** Dover. New York, NY. 161p.

An engineering text which analyses and offers solutions to practical waterhammer problems associated with gates, pumps, pipes and other operations. Reliability of analysis methods has been demonstrated in field tests. An elementary knowledge of hydraulics and calculus is essential.

Choudry, Waterhammer Text. Has computer program listings. Same author produces a waterhammer computer program package, which is relatively expensive but covers most applications.

Hydrology

Acres International Ltd. (1984). ***Hydrologic Design Methodologies for Small-Scale Hydro at Ungauged Sites- Phase I.*** Energy, Mines and Resources Canada, Ottawa, Ont.

Acres International Ltd. (1985). ***Hydrologic Design Methodologies for Small-Scale Hydro at Ungauged Sites- Phase II .*** Energy, Mines and Resources Canada, Ottawa, Ont.

Acres International Ltd. (1988). ***Streamflow Analysis Methodology for Ungauged Small-Scale Hydro Sites.*** Energy, Mines and Resources Canada, Ottawa, Ont.

Acres International Ltd. (1994). ***Hydrologic Design Methodologies for Small-Scale Hydro at Ungauged Sites- Upgrading of Ontario and Atlantic Province Models .*** Environment Canada, Water and Habitat Branch, Ottawa, Ont.

Intakes

American Society of Civil Engineers. Energy Division. Committee on Hydropower Intakes. (1995). ***Guidelines for the Design of Intakes for Hydroelectric Plants.*** American Society of Civil Engineers, New York, NY. 469p.
State-of-the-art guidelines for the sound environmental design of intakes. Information provided on intake types and features, forebay, hydraulic design considerations, trashrack and gate design, fisheries considerations, sedimentation, and environmental factors.

Lauterjung, H. & Schmidt, G. (1989). ***Planning of Intake Structures.*** Vieweg, Braunshweig 122p.
A planning guide written for nonspecialists providing most important fundamentals for the planning and design of intakes. Contains description of the essential basic hydrological data required, hydraulic modes of operation and calculation methods for proof of stability. Presupposes some advanced mathematical knowledge.

Lessons learned

American Society of Civil Engineers. Energy Division.Task Committee on Lessons Learned from the design, Construction and Operation of Hydroelectric Facilities. (1994). ***Lessons learned from the Design, Construction and Operation of Hydroelectric Facilities.*** American Society of Civil Engineers, New York, NY.
A compilation of over 70 project examples which include a number of micro hydro developments. Easy to read case studies identify specific problems, causes and effects, investigations, actions taken, and lessons learned.

Miscellaneous topics

United States. Army Corps of Engineers (1981). ***Waterpower '81. An International Conference on Hydropower. June 22-24, 1981. Volume 1.*** USBR, Washington, DC. 898p.

American Society of Civil Engineers. (1983). ***Waterpower '83. International Conference on Hydropower. September 18-21, 1983, Knoxville, Tennessee. Volume 1.*** ASCE, New York, NY..556p.

American Society of Civil Engineers. (1985). ***Waterpower '85. International Conference on Hydropower. Las Vegas, Nevada, September 25-27, 1985. Volume 1.*** ASCE, New York, NY. 682p
These three *Waterpower* conferences of the early 1980's had a major focus on small and micro hydro, reflecting the wide interest in these areas at the time. Numerous case studies are presented, and issues discussed, many of which are still relevant.

Renewable Energy - Small Hydro: Select Papers. (1997). Ashgate Publishing, Aldershot, Hants. 390p

Penstocks

American Society of Civil Engineers. Energy Division. Committee on Manual of Practice for Steel Penstocks. (1993). ***Steel Penstocks*****.** American Society of Civil Engineers, New York, NY. 432p.
Everything you need to know about steel penstocks: design, manufacture, installation, testing, startup, and maintenance, including branches, wyes, associated appurtenances, and tunnel liners. Extensive section on design examples, with calculations.

American Iron and Steel Institute. (1992).***Steel Plate Engineering Data-Volume 4. Buried Steel Penstocks.*** (1992). American Iron and Steel Institute, Washington, DC. 87p.
A technical manual which assembles data and procedures successfully used in the design of buried penstocks. Includes sections on hydraulics, thrust restraint, pipe joints, linings and coatings, corrosion and methods of controlling it. Extensively illustrated.

American Iron and Steel Institute.(1982).***Steel Plate Engineering Data-Volume 4. Steel Penstocks and Tunnel Liners. A manual on materials, design and construction with design computations****.* (1982). American Iron and Steel Institute, Washington, DC. 111p.
Most of this manual is devoted to design and construction, but important preliminary sections consider design conditions and allowable stresses pertaining to non-embedded, buried, and concrete-embedded steel penstocks, and to tunnel liners. Appendices present sample design computations. Clearly illustrated with graphics and tables, and uses text suitable to the lay person.

Plastic Pipes

Sclairpipe (high density polyethylene pipe) Design, Construction Manuals. KWH Pipe (Canada) Ltd.

American Water Works Association (AWWA). ***Standards C900 for Polyvinyl Chloride (PVC) Pressure Pipe.*** AWWA.

Uni-Bell Handbook of PVC Pipe, Design and Construction. Uni-Bell PVC Pipe Association.

Protection and control

Ottawa Engineering & Acres International Ltd. (1996*).* ***Low Cost Protections and Control for Mini-Hydro Intertie.*** Canadian Electrical Association, Montreal, Q. n.p. [CEA 9152 G 973]
A report on a study into the concerns and requirements of Canadian utilities with respect to control, protection and operation of mini-hydro interties. Identifies and evaluates low cost protection & control equipment. Includes case studies.

Powerlines

BC Hydro. ***Overhead Distribution Standards (1992): Overhead Electrical***, ***ES43 Series.***

Kurtz, E.B. and Shoemaker, T.M. (9th Edition). ***The Lineman's and Cableman's Handbook***, McGraw Hill, 1056 p.
Covers basic principles and best procedures for the construction, operation and maintenance of overhead and underground electric distribution and transmission lines.

Pumps as Turbines

Chapallaz, J-M., Eichenberger, P. & Fischer, G.(1992). ***Manual on Pumps used as Turbines***. Vieweg, Braunschweig, FRG. 221p.
Published in cooperation with MHPG, The Mini Hydro Power Group, this manual provides a detailed account of the use of pumps as turbines in micro-hydro schemes. Includes selection charts based on the test results of over 80 PATs to enable engineers or technicians select a unit for a specific purpose.

Koch, C. P. (1990). ***Supplement to the small hydroelectric design manual*****.** C.P. Koch, New Westminster, BC. 12p.
A small manual in 3 sections: a method of estimating a centrifugal pump's performance as a turbine based on manufacturer's efficiency data, how to ascertain the suitability of a used pump with unknown data, and how to install a pump.

Williams, Arthur et al. (1995). ***Pumps as Turbines : A Users Guide***. Nottingham Trent Univ., Nottingham, UK. 58p.
Reprinted in 1997, this is a practical handbook to the use of standard pump units as a low-cost alternative to conventional turbines.

Steel pipe (see also Penstocks)

American Iron and Steel Institute. rev.ed.(1992).***Steel Plate Engineering Data-Volume 3. Welded Steel Pipe: Merits, Design Standards, Technical Data and References****.* American Iron and Steel Institute, Washington, DC. 113p.
A compilation of useful and readable information for the design of water systems using welded steel pipe. Includes design criteria and procedures, joints, fittings, above ground installations, corrosion and protection coatings. Complemented with technical charts and tables.

American Water Works Association. (1987). ***Steel Pipe - A Guide for Design and Installation. Manual M11***. AWWA. 174 pp.
Although intended for water supply lines, this manual also has application to steel penstocks and has sections on pipe characteristics, manufacture, hydraulics, design, joints, fittings, corrosion, handling and special details.

Turbines

Thake, J. (1999). ***Micro-Hydro Pelton Design Turbine Manual: Design, Manufacture and Installation for Small-scale Hydro-power***. Intermediate Technology Development Group London. 320p.
Recent comprehensive text on the use of Pelton turbines in micro hydro situations. Available through Stylus Publications, VA.

References available from CISTI (Canadian Institute for Scientific and Technical Information)

For purchase or borrowing arrangements see http://cat.cisti.nrc.ca/

Inversin, Allen R. (1986). ***Micro-hydropower sourcebook : a practical guide to design and implementation in developing countries.*** NRECA International Foundation, Washington, D.C. A complete reference to the planning, construction and implementation of micro schemes.

American Energy Organization (OLADE)**.** (1983*).* ***Mini-hydropower stations : a manual for decision makers****.* United Nations (UNIDO), New York, NY.

Canada. Centre for Mineral and Energy Technology. (1990). ***Development of a stand-alone induction generator for low cost micro-hydro systems.*** Centre for Mineral and Energy Technology, Ottawa, Ont.

Canada. Centre for Mineral and Energy Technology. Alternative Energy Division. (1979*).* ***Micro-hydro power : reviewing an old concept.*** NTIS, Springfield, Va.

Monition, L., Le Nir, M & Roux, R. (translated by Joan McMullan). (1984). **Micro hydroelectric power stations** . J. Wiley, New York, NY.

Kahn, A & Hinton, E. (1994*).* ***Modelling Design Sensitivity and Optimization of Micro-Hydro Schemes: Part 1 - Characteristic Features.*** Department of Civil Engineering, University of Wales, Swansea, Wales. [Internal report CR/832/94].

Kahn, A & Hinton, E. (1994). ***Modelling Design Sensitivity and Optimization of Micro-Hydro Schemes: Part 2 - System Analysis and Optimization by Dynamic Programming***. Department of Civil Engineering, University of Wales, Swansea, Wales. [Internal report CR/832/94].

PUBLISHED PAPERS
Innovative Technologies, International Perspectives and Case Studies

Antloga do Nascimento *et al*. (1999). "The evolution of small hydro plants in Brazil: New concepts for a new age" in *Hydropower into the Next Century, Gmunden, Austria, October 1999. Conference Proceedings.* International Journal on Hydropower & Dams, Sutton, Surrey, UK. p. 71-80.

"Avoiding failure of mini hydro bearings". (1998). *International Journal on Hydropower & Dams*. 5 (4). p. 79-80.

Barnes, Marla. (1991). "Strathcona Hydro: Carrying on a dream." *Hydro Review.* 10 (7), December. p. 52-62.

Baxendale, J. (1997). "Planning the Dulyn Eigiau small hydro scheme in Wales". *International Journal on Hydropower & Dams.* 4 (4). p. 65-68.

Beggs, S.L. . (1992). "Independent Canadian hydro: Responding to opportunities". *Hydro Review.* 11 (3), June. p. 28-32.

Bell, P.A. & Smith, N. (1995). "Increasing the efficiency of stand-alone self-excited induction generators for micro-hydroelectric schemes*." International Journal of Ambient Energy*. 16, (3), July, p 155-161.

Bouziane,S., Deschenes,C. (1998). "Testing the characteristics of a propeller micro hydro turbine". *International Journal on Hydropower & Dams.* 5 (4), p. 53-9.

Brekke, H. (1999). “Utilizing small hydro for increased hydro production” in *Hydropower into the Next Century, Gmunden, Austria, October 1999. Conference Proceedings.* International Journal on Hydropower & Dams, Sutton, Surrey, UK. p. 81-89.

Brown, A. (1998). “Causes of breakdowns at micro hydro systems”. *International Journal on Hydropower & Dams.* 5 (4). p. 81-82.

Busse, E., Haag, T &Coupe, L. (1992). “Generating electricity along municipal water supply systems”. *Hydro Review*. 11 (2), April. p. 28-38.

Clemen, D. & Hayes, S. (1989). “Start-up and commissioning procedures for hydro electric units”. *Hydro Review*. 8 (3), February. p. 64-70.

“Cost effective small hydro control”. (1996). *International Water Power and Dam Construction*. 48 (10). p. 30-33.

Cowdrey, J.M. (1996). “Making small hydro work well on a water supply system”. *Hydro Review*. 15 (1), February. p. 52-60.

Croker, K. & Rees, G. (1998). “Software package puts small hydro on the map”. *International Water Power and Dam Construction*. 50 (3), p. 42-43.

Dygert, D. (1999). Restoring turbine efficiency with abrasion resistant epoxies.” *Hydro Review .* 18 (4), July. p. 28-33.

FitzPatrick, J.B. (1993). “Investigating syphon hydro intake installations*”. Hydro Review Worldwide.* 1 (2), Fall. p. 28-33.

“Foundations for a harmonious future”. (1998). *International Water Power and Dam Construction*. 50 (3). p. 34-37.

Gökler, G. & Heigerth, G. (1999). “Powerplant of the Viktor Kaplan Academy: an innovative mini hydro” in *Hydropower into the Next Century, Gmunden, Austria, October 1999. Conference Proceedings.* International Journal on Hydropower & Dams, Sutton, Surrey, UK. p. 109-115.

Haynes, F. D. (1993). “Seeking solutions for icing at dams and hydro plants”. *Hydro Review*. XII (7), December. p. 58-64.

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USEFUL WEBSITES

See also Websites for Manufacturers and Suppliers.

Canadian

http://www.de.com.au/external_links/canada.html
Canadian Power Related Links

http://geonames.nrcan.gc.ca/english
Natural Resources Canada site at which it is possible to determine latitude, longitude, and topographic map number for a particular site.

http://www.IPPSA.com/
Independent Power Producers Society of Alberta

http://www.newenergy.org/newenergy/
Website of IPPSO, the Independent Power Producers' Society of Ontario.

http://maps.nrcan.gc.ca/topographic.html
Use to order topographic maps for general locations from Natural Resources Canada.

http://www.renewables.ca/index2.html
Canadian Association for Renewable Energies: A federal non-profit association, incorporated to promote feasible applications of renewable energies. Offers frequently updated news and information. An archive holds records of previous bulletins. Useful international perspective.

http://www.retscreen.gc.ca/
This is the site of the downloadable Renewable Energy Project Analysis Software, RETScreen, developed by the Government of Canada through the CANMET Energy Diversification Research Laboratory (CEDRL) of Natural Resources Canada. The RETScreen Small Hydro Model is based on twenty years of data and can be used to evaluate micro hydro projects using worksheets to carry out an energy model, a cost analysis and a financial summary. A hydrology worksheet is also provided.

Other

http://www.crest.org/renewables/SJ/hydro/
http://solstice.crest.org/renewables/re-kiosk/hydro/index.shtml
Includes three small hydro case studies. Solstice is the Internet information service of the Renewable Energy Policy Project and the Center for Renewable Energy and Sustainable Technology (REPP-CREST), and is a site dedicated to sustainable energy and development information.

http://www.energyfinance.org/
Welcome to the new Green Energy Finance Web Site, sponsored by the U.S. DOE and the U.S. EPA, and developed by CREST, the Center for Renewable Energy and Sustainable Technology.

http://www.eren.doe.gov/
U.S. Department of Energy with links.

http://www.eren.doe.gov/consumerinfo/refbriefs/ab2.html
Is a Micro-Hydroelectric System Feasible for You? An on-line paper, published by DOE. A starting point to the issues which should be considered and methods which may be used to carry

out a preliminary feasibility assessment of a micro hydroelectric system. A reference list at the end of this brief provides sources of more information.

http://www.hydro.org/
National Hydropower Association

http://www.iea.org/homechoi.htm
International Energy Agency

http://www.osti.gov/eren/eren.html
Energy Science and Technology Database (EDB) EREN database with links to the National Renewable Energy Laboratory, Clean Energy Basics, Renewable Electric Plant Information System & US Department of Energy Hydropower Program

http://www.rsvp.nrel.gov/Library/nrecabks.html
The US National Renewable Energy Laboratory

http://www.small-hydro.com
This site is a front-end to a database, which stores information about countries, contacts, organisations, and programs and activities related to small hydro. Links to related sites. Valuable to anyone wishing to find a complete source of Contact information, as well as information on the state of Small Hydropower in many countries.

PUBLISHERS & BOOKSHOPS SPECIALIZING IN ALTERNATIVE ENERGIES

Canada
http://cat.cisti.nrc.ca/
Canada Institute for Scientific and Technical Information, a National Research Council initiative.

Other
http://www.jademountain.com
Jade Mountain Inc., P.O. Box 4616, Boulder, CO 80306

http://www.mayabooks.ndirect.co.uk/index.html
Maya Books, PO Box: 379, Twickenham TW1 2SU. UK.Tel/Fax: 44-(0)208-287-9068
e-mail: sales@mayabooks.ndirect.co.uk

http://www.ashgate.com
Ashgate Publishing Co., Aldershot, Hants, UK. Email: info@ashgatepub.co.uk

Styluspub@aol/com
Stylus Publishing, P.O. Box 605, Hendon, VA. 20172-0605. Distributors in North America for publications of Intermediate Technology Publications, London. UK. Email:Styluspub@aol.com

SUPPLIERS & MANUFACTURERS
Note: This section only provides information on specialized equipment including turbines, generators, controls, pipe, electrical and intake equipment. There is no attempt made to list sources of common construction materials such as steel, concrete, lumber, prefab buildings etc.

British Columbia

Packaged Plants

Energy Alternatives
825 Laval Crescent
Kamloops BC V2C 5P2
Ph: 250-374-3943
Toll free: 1800-265-8898
Fax: 250-679-8589
Email: energyalternatives@bc.sympatico.ca

Thomson & Howe Energy Systems
Site 17 Box 2 SS#1
Kimberley BC V1A 2Y3
Phone: 250-427-4326
Fax: 250-427-4326
Email: thes@cyberlink.bc.ca

Turbines

Boundary Electric (1985) Ltd
7990 Columbia Drive
PO Box 758
Grand Forks BC V0H 1HO
Ph: 250-442-5561
Fax: 250-442-8322

Dependable Turbines
Unit 7, 3005 Murray Street
Port Moody, BC V3H 1X3
Phone: (604) 461-3121
Fax: (604) 461-3086
Email: dtlhydro@towncore.com

Controls

Thomson Technology Inc.
19214-94th Avenue
Surrey BC V3T 4W2
Ph: 604-888-0110
Fax: 604-888-381
Email: ttinfo@tti.bc.ca
Website: http://www.thomsontechnology.com

HDPE pipe and PVC pipe

Pacific-Polypipe Ltd.
9515-195 Street
Surrey BC V4N 4G3
Ph: 604-513-8197
Toll free: 1800-659-4545
Fax: 604-513-8207
Email:gmd@istar.ca
Website: http://www.infomine.com/pacificpoly-pipe or http:/www.pacificpolypipe.com

Prolite Plastics
1620 Kingsway Ave.,
Coquitlam V3C 3YG

Ph: 604-944-0282
Fax: 604-944-8854

Steel pipe

Pipe and Piling Supplies (B.C.) Ltd.
1835 Kingsway Avenue
Port Coquitlam BC V3C 1S9
Ph: 604-942-6311
Fax: 604-941-9364
Website: http://www.pipe-piling.com

Substations

Marcus Transformer of Canada Ltd.
19522 96 Avenue,
Surrey, BC
Ph: 604-882-8488

Best Coil Ltd.
12 8333 130 Street,
Surrey, BC
Ph: 604-543-7739

Boundary Electric (1985) Ltd
7990 Columbia Drive
PO Box 758
Grand Forks BC V0H 1HO
Ph: 250-442-5561

GEC Alsthom
1-2155 Rosser
Burnaby, BC
Ph: 604-291-8881

Out of Province Suppliers

Packaged Plants, Turbines

Canadian Hydro Components Ltd.
16 Main Street Box 640
Almonte, ONT K0A 1A0
Ph: 613-256-1983
Fax: 613-256-4235
Email: hydro@istar.ca
Website: http://www.canadianhydro.com

Canyon Industries
5500 Blue Heron Lane
PO Box 574
Deming WA 998244
Ph: 360-592-5552
Fax: 360-592-2235
Email: citurbine@aol.com

Sulzer Hydro
60 Worcester Road

Rexdale ONT M9W 5X2
Ph: 416-674-2034
Fax: 416-213-1031
Email: thomas.taylor@sulzer.com
Website: http://www.sulzer.com

Packaged plants, Controls

Powerbase Automation Systems Inc.
150 Rosamond Street
Carelton Place, ONT. K72C 1V2
Ph: 613-253- 5358
Fax: 613-257-1840
Email: ygrandmaitre@powerbase.com
Website: http://www.hydrocontrols.com/

Phoenix Power Control Inc.
17921 Bothell-Everett Highway #103
Bothell WA 98012
Ph: 425-398-8771
Fax: 425-398-8772
Email: hvernon@msn@phoenixcontrol.com

Sulzer Hydro
60 Worcester Road
Rexdale ONT M9W 5X2
Ph: 416-674-2034
Fax: 416-213-1031
Email: thomas.taylor@sulzer.com

Ice Control

Fleet Technology Ltd.
311 Legget Drive
Kanata ONT K2K 1Z8
Ph: 613-592-2830
Fax: 613-592-4950
Email: razek@fleet.co
Website: http://www.fleetech.com

Rubber dams

Bridgestone Engineered Products Co., Inc.
18377 Beach Blvd, Ste 216
Huntington Beach, CA 92648-1349
Ph: 1-714-377-7346
Fax: 1-714-377-2485
Website: http://www.bridgestoneengprod.com/Tan.htm

Obermeyer Hydro Inc.
PO Box 668
Fort Collins CO 80522
Ph: 970-568-9844
Fax: 970-568-9845
Email: hko@obermeyerhydro.com
Website: http://www.obermeyerhydro.com

Turbines
Voith Hydro Power Generation
PO Box 712
York PA 17405
Ph: 717-792-7000
Fax: 717-792-7263
Website: http://www.voithyork.com/

PUBLICATIONS
The following are regularly published resources for small hydro and alternate energy information, although Energy Projects of all sizes may also be described.

Hydro Review
HCI Publications
410 Archibald Street
Kansas City, MO 64111-3046
Ph: 816-931-1311
Email: hci@aol.com

International Water Power and Dam Construction
PO Box 200
Ruislip, Middlesex HA4 OSY
United Kingdom
Ph: 44-181-841-3970
Email: waterpower@wilmington.co.uk

IPPSO Facto
Independent Power Producers' Society of Ontario
163-C Eastbourne Ave.,
Toronto, ONT. M5P 2G5
Ph: 416-322-6549
Email: IPPSO@ippso.org

6. SITE CLASSIFICATION AND COMPARATIVE ANALYSIS

Micro Hydro Database

Table 6.1 below, shows the distribution of sites based on installed capacity and head. Low head sites are defined as sites with gross head less than 30m. Similarly, medium head sites have gross head between 30m and 150m, and high head sites have head more than 150m. Note that due to the limitations in mapping, noted in Section 3, that there is a bias away from low head sites as they are difficult to identify from maps.

TABLE 6.1

Installed Capacity	Total number of sites	High Head	Medium Head	Low Head
Less than 0.5 MW	78	10	51	17
0.5 MW to 1 MW	110	32	70	8
1 MW to 2 MW	165	59	93	13
2 MW to 5 MW	219	116	98	5
Total	572	217	312	43

Table 6.2 shows the total 'green' energy available for each of the groups discussed above.

TABLE 6.2

Installed Capacity	Total GWh	High Head GWh	Medium Head GWh	Low Head GWh
Less than 0.5 MW	123	14	78	31
0.5 MW to 1 MW	375	98	247	30
1 MW to 2 MW	1,085	387	604	94
2 MW to 5 MW	3,427	1,848	1,475	104
Total	5,010	2,347	2,404	259

Tables 6.3 summarizes the number of sites, with less than 2 MW capacity, in each region (see Figure 4.1) and the total capacity and energy.

TABLE 6.3

Region	**Number of sites**	**Total Capacity** (MW)	**Total Green Energy** (GWh)
1	66	69.2	260.8
2	51	59.3	252.7
3	122	102.3	519.2
4	17	20.7	80.7
5	15	12.3	46.7
6	6	10.2	52.3
7	10	11.7	46.1
8	29	36.6	169.0
9	13	11.3	61.3
10	-	-	-
11	15	16,9	74.1
12	-	-	-
13	9	6.4	20.1
Total	**353**	**356.9**	**1,583.0**

Tables 6.4 summarizes the number of sites, from 2 to 5 MW capacity, in each region (see Figure 4.1) and the total capacity and energy.

TABLE 6.4

Region	**Number of sites**	**Total Capacity** (MW)	**Total Green Energy** (GWh)
1	57	206.1	794.1
2	65	251.2	1,099.1
3	37	112.5	571.9
4	12	45.0	177.4
5	4	14.0	64.5
6	13	47.7	244.4
7	9	31.5	124.2
8	7	26.8	126.8
9	5	15.6	86.0
10	-	-	-
11	8	27.1	123.8
12	-	-	-
13	2	4.9	14.9
Total	**219**	**782.4**	**3,427.1**

Figure 6.1 shows the distribution of sites based on their estimated cost ($/kWh). Sites are grouped based on their installed capacity. The figure may be used to estimate the percentage of sites that could be feasible for a given electricity price.

Figure 6.2 shows the cumulative energy for sites with less than 2 MW and sites with 2 to 5 MW capacity. Both the total energy and the 'green' energy are shown for each group of sites.

Figure 6.3a combines some of the information presented in Figures 4.1 and 4.2 for sites with less than 2 MW installed capacity. The figure shows the distribution of sites based on their estimated cost and superimposes the cumulative energy of these sites. This figure may be used to estimate the total potential energy available if all sites below a certain cost are developed. **Figure 6.3b** shows similar information for the 2 to 5 MW sites.

Figure 6.4a shows the percentages of the civil cost components for sites less than 2MW. Similar information is shown in **Figure 6.4b** for sites with capacity from 2 to 5 MW. Another comparison can be made between the relative costs of high head sites less than 2 MW (**Figure 6.5a**) and low head sites less than 2 MW (**Figure 6.5b**). As expected, the relative cost of the penstock is higher for the high head sites, however, development costs are often lower for high head sites because the penstocks and mechanical components are smaller.

Figure 6.1 Distribution of Potential Small Hydro Sites based on Cost/kWh

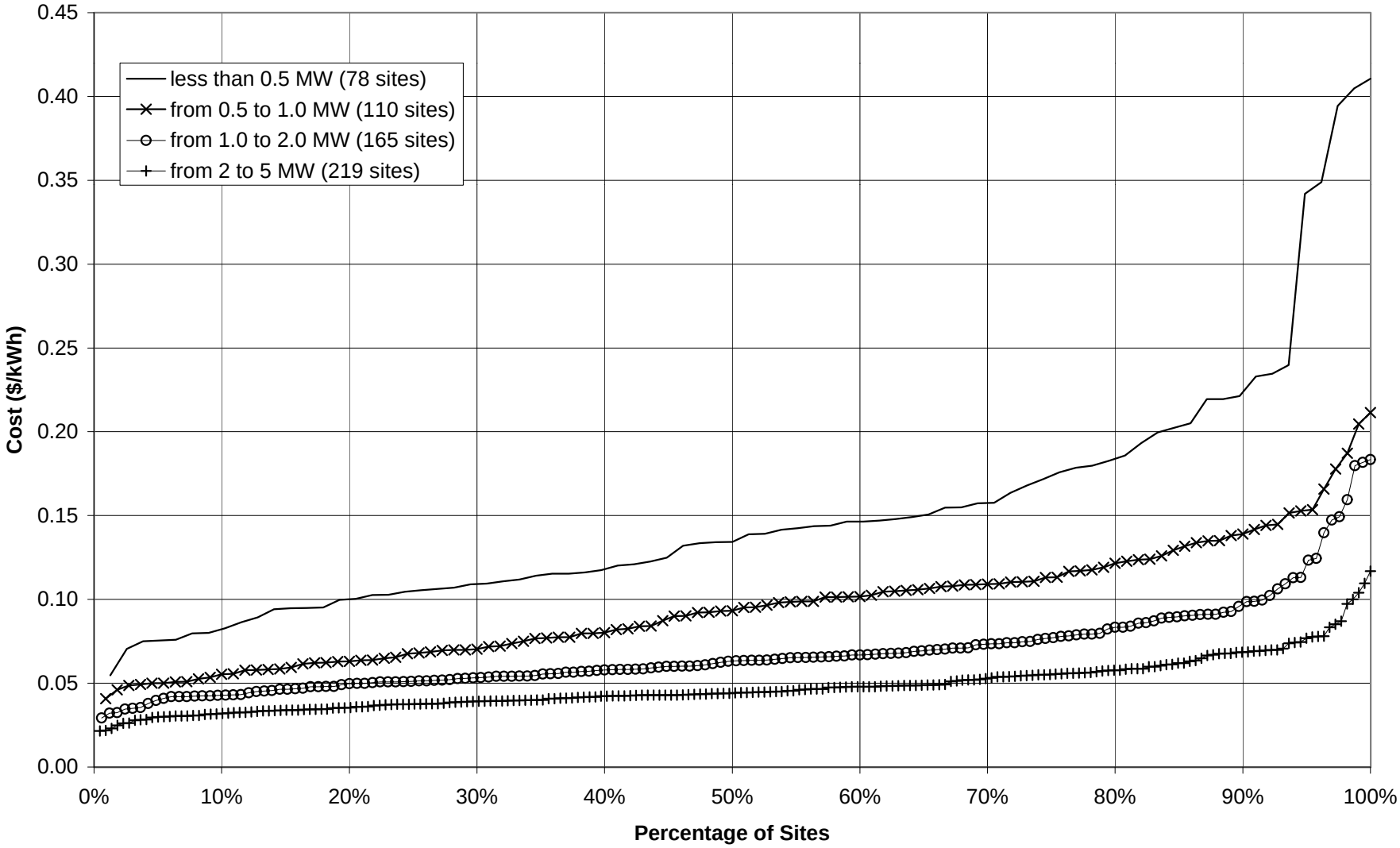


Figure 6.2 Cumulative Energy

Note: The Cumulative Energy shown in this chart is calculated after the sites have been ranked based on energy

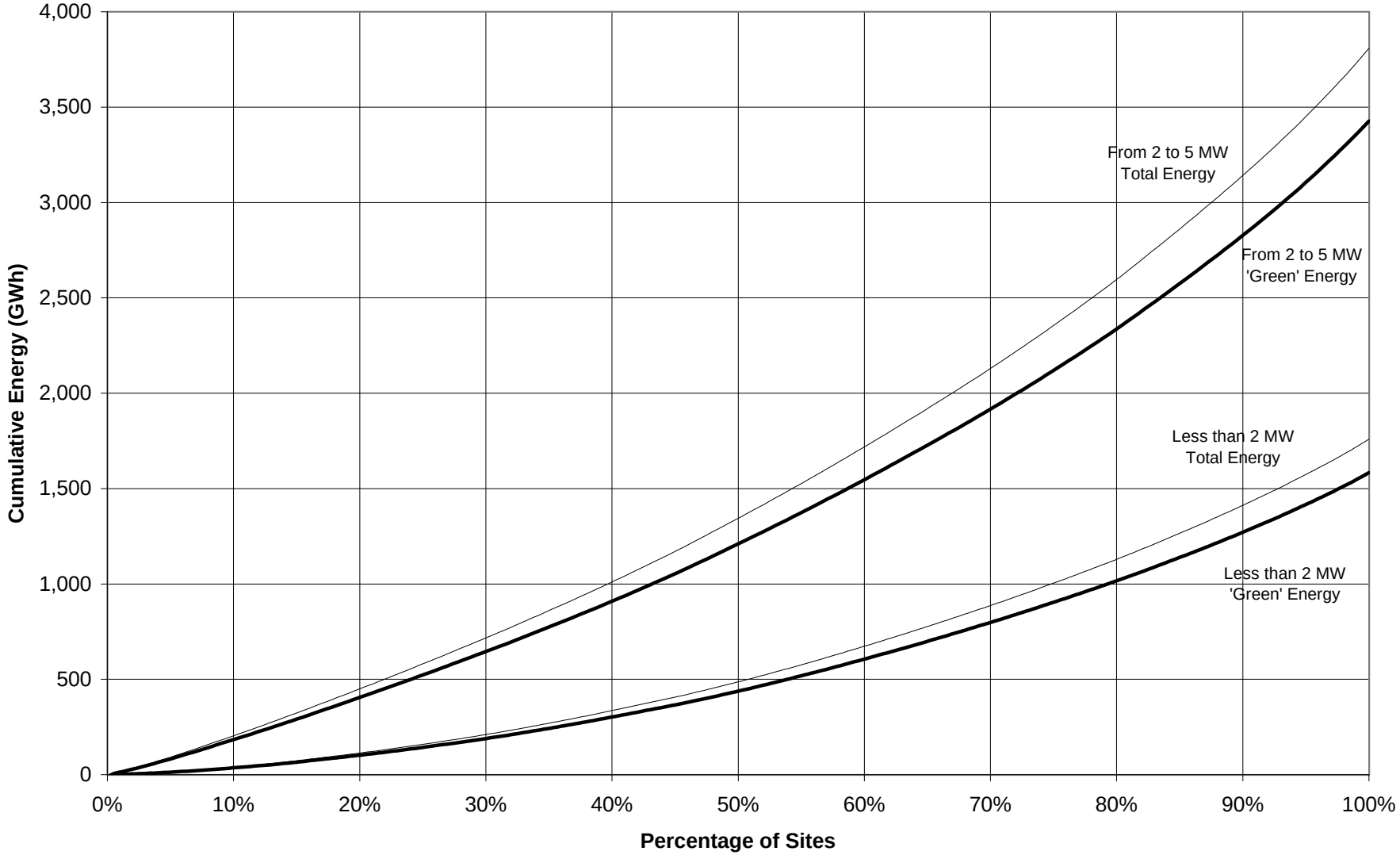


Figure 6.3a Cost Distribution and Cumulative 'Green' Energy
Sites with less than 2 MW installed capacity

Note: The Cumulative Energy shown in this chart is calculated after the sites have been ranked based on cost

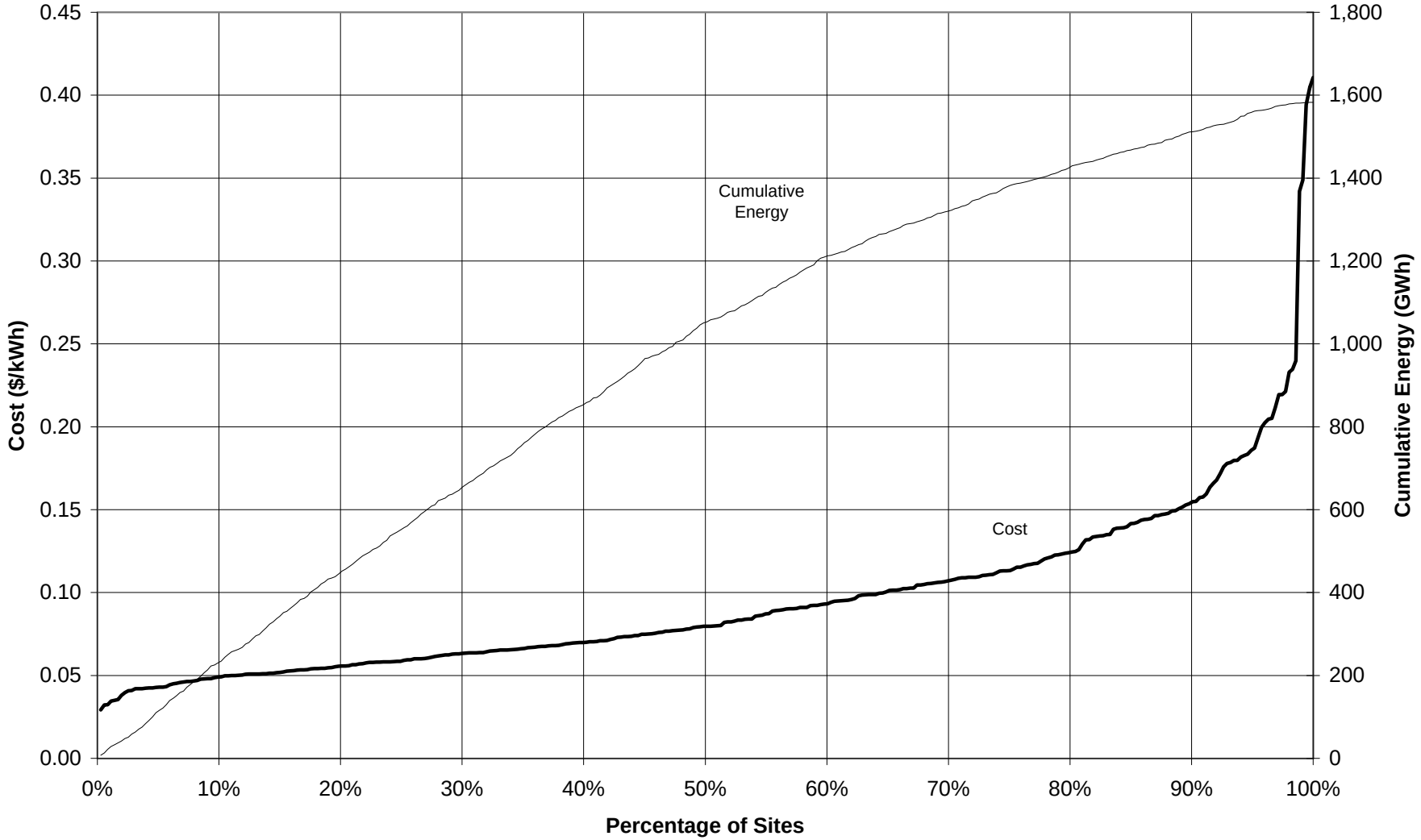
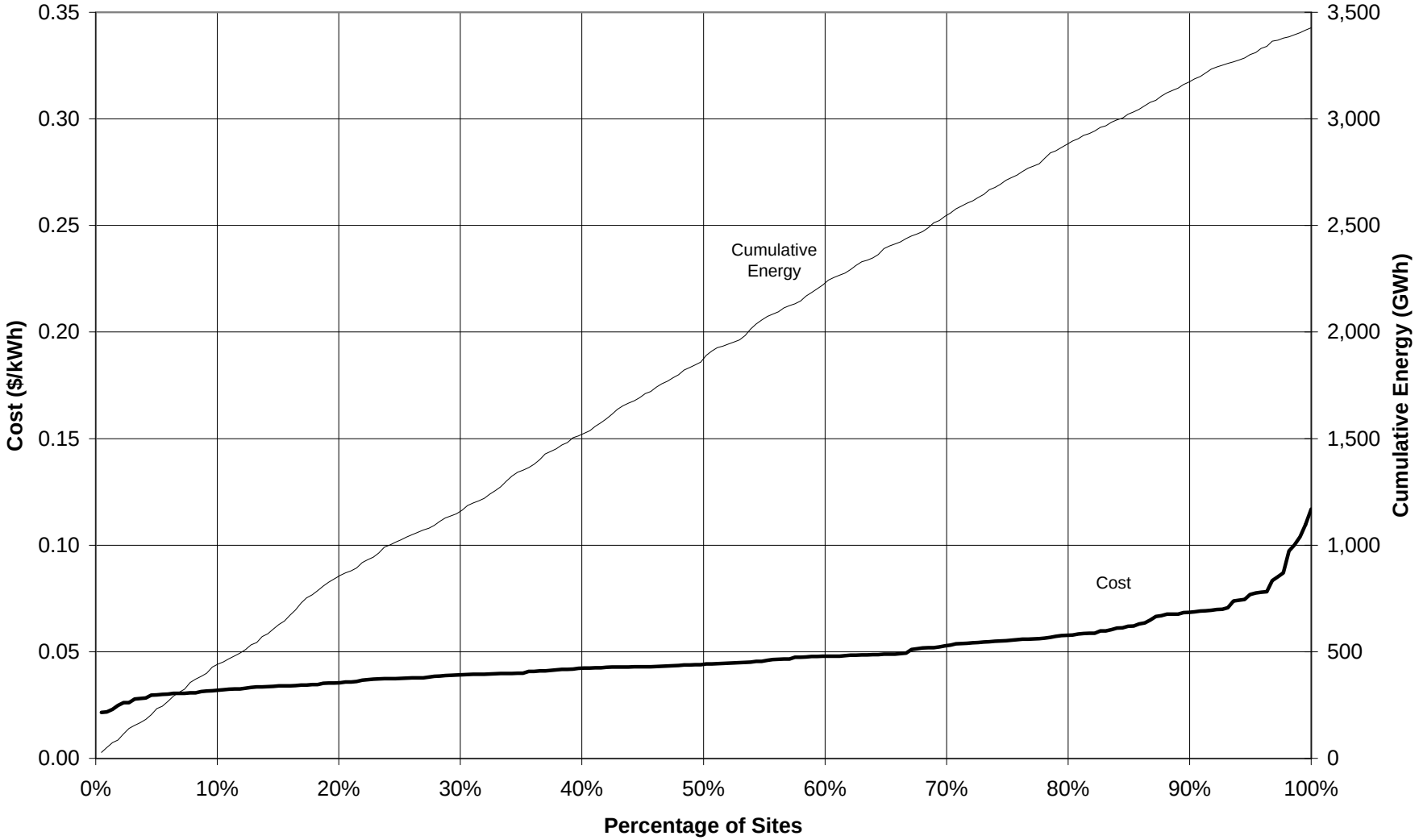


Figure 6.3b Cost Distribution and Cumulative 'Green' Energy
Sites with 2 to 5 MW installed capacity

Note: The Cumulative Energy shown in this chart is calculated after the sites have been ranked based on cost



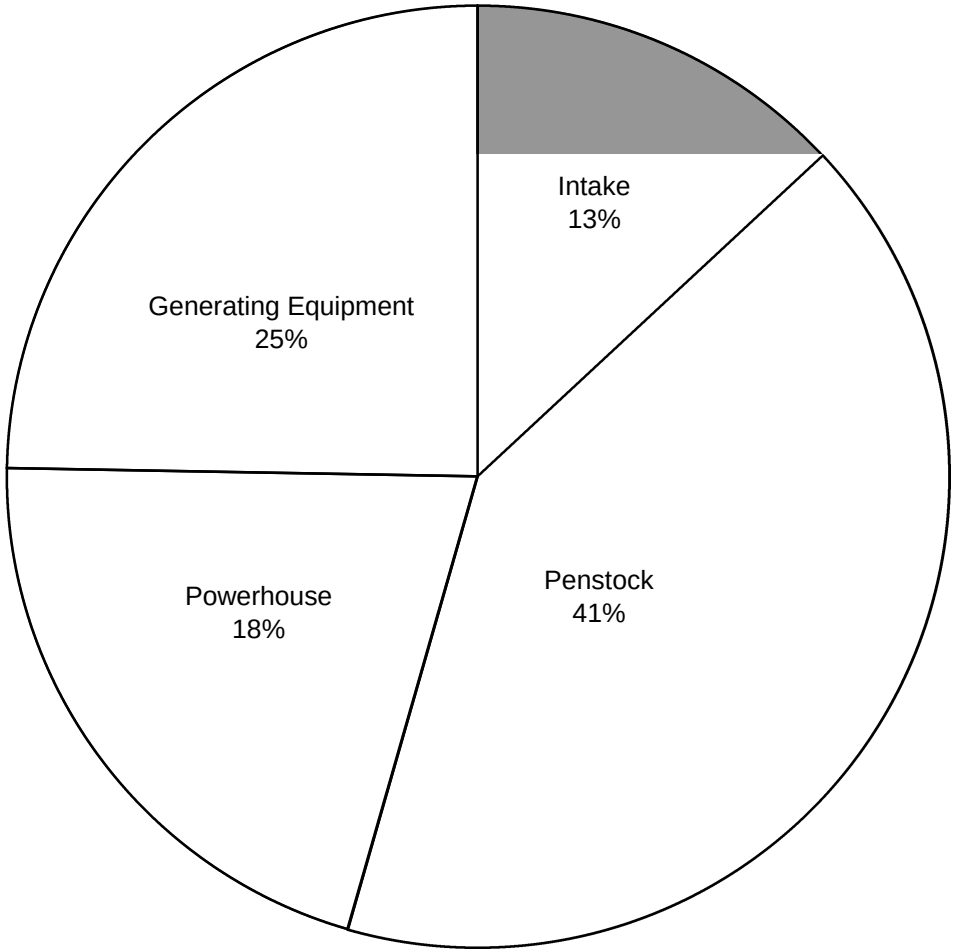


FIGURE 6.4a
Civil Cost of Sites Less than 2MW

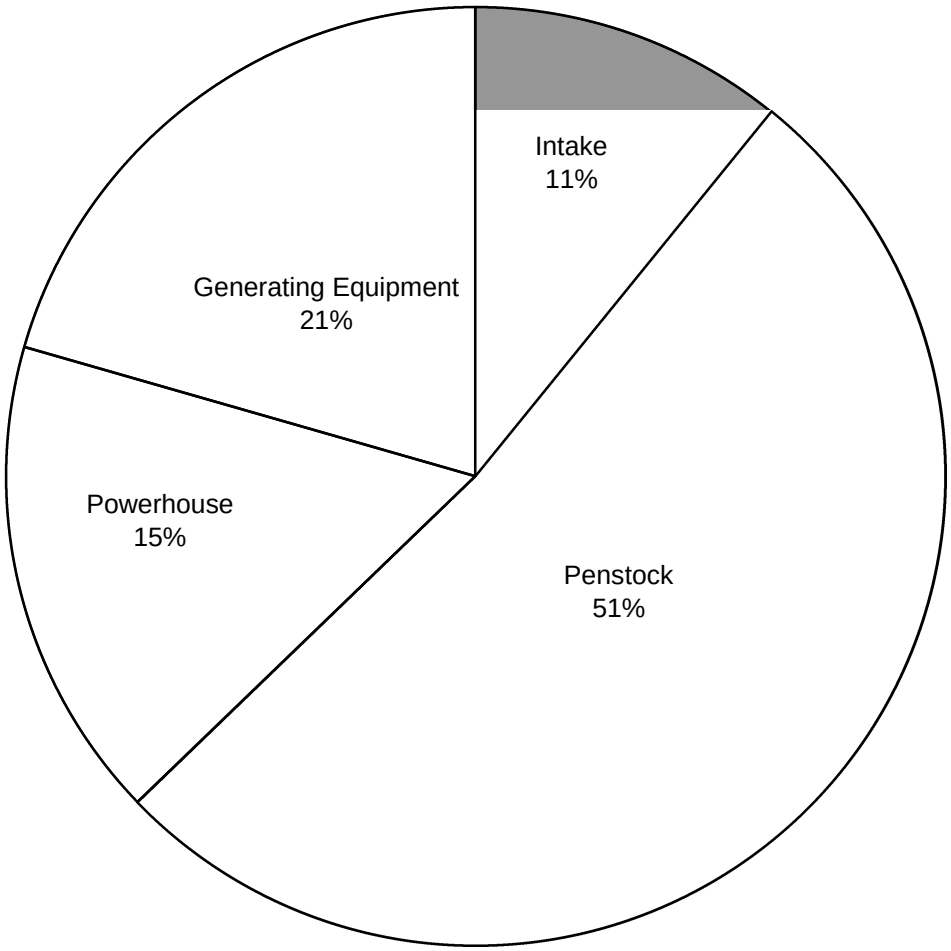


FIGURE 6.4b
Civil Cost of Sites from 2 to 5MW

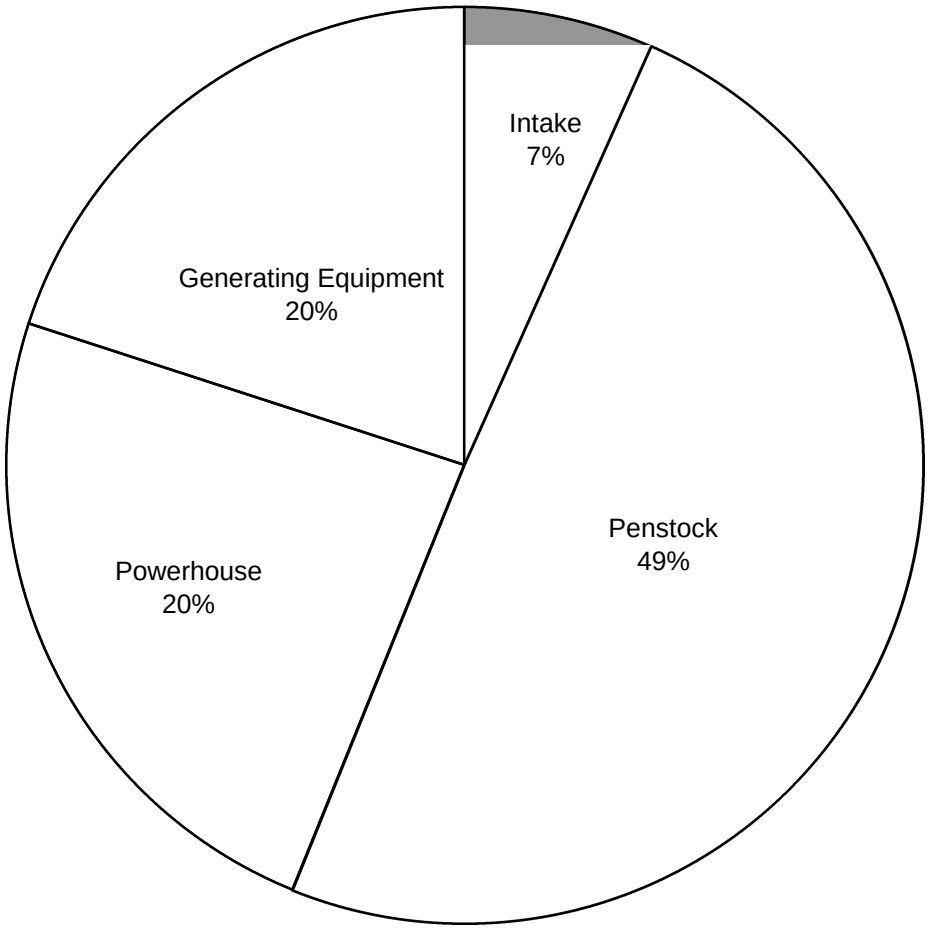


FIGURE 6.5a
Civil Cost of Sites Less than 2MW - High Head (>150m)

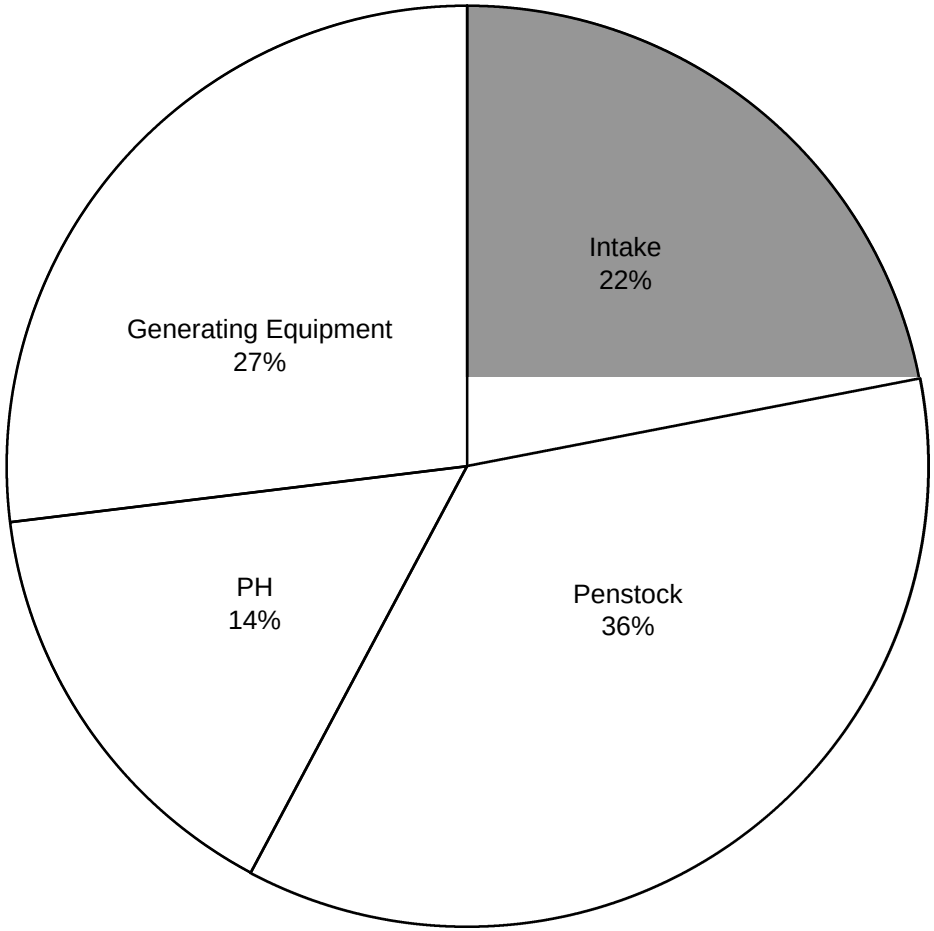


FIGURE 6.5b
Civil Cost of Sites Less than 2MW - Low Head (=30m)

APPENDIX

BC HYDRO
GUIDELINES

SUBJECT: BC Hydro's Criteria for Definition of Green Micro-Hydro Generation

INTRODUCTION:

The definition of a hydro development as capable of generating green energy depends on the scale of the development, the type of river involved, and the development design. BC Hydro wishes to explore and advance the opportunity for micro-hydro developments; defined as generators between 100kW and 2MW. Generation developments of this scale usually involve limited flows and development of as great a head as possible on steep slopes, to limit the cost of the turbine and penstock.

The criteria adopted for green generation from micro-hydro developments are designed to ensure that these developments have a low impact on the environment. BC Hydro will regard micro-hydro developments as "green" if they are not located on fish-bearing streams, have a low impact on the natural environment and are licensable by applicable environmental regulators. The evaluation will be applied on a case by case basis and involve an assessment of development attributes.

CRITERIA:

BC Hydro will classify micro-hydro sites as capable of green generation if at a given site the following conditions are met:

- The development is planned on a stream that is not fish bearing as defined by the Federal Fisheries Act.
- The development is not located on a "sensitive stream" as designated under the Fish Protection Act.
- The development does not divert more than 80 % of average daily flow from stream channel in a bypassed reach.
- The development does not impact any endangered, threatened or species of special concern.
- The development is licensable under the Water Act.
- The development, including flows into receiving streams and through bypassed reach, is licensable under the Fisheries Act.

Figure A1.1 - Green Generation Reduction - Coastal stream
Flow Duration Curve (08GA060 - Chapman Creek above Sechelt Diversion)

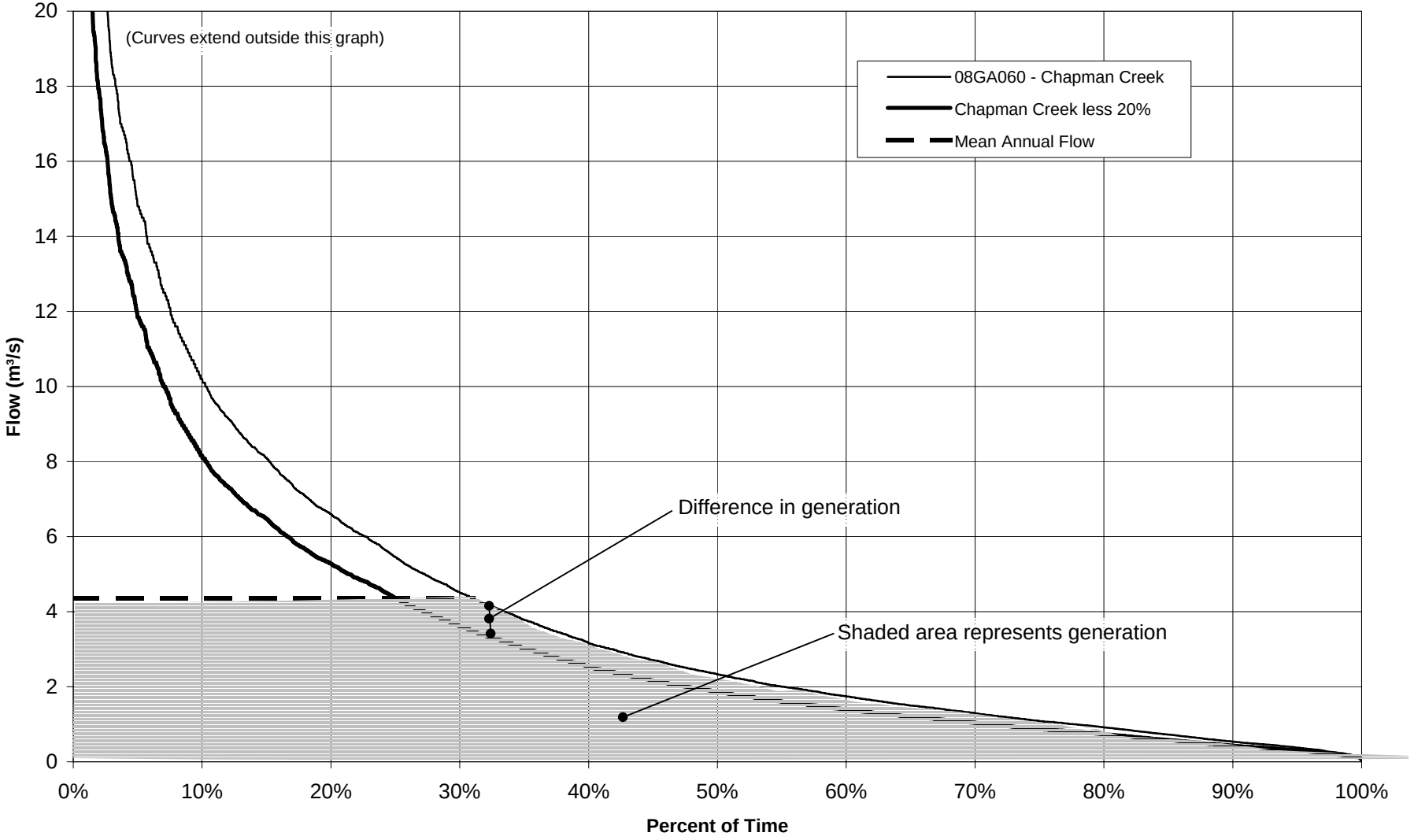


Figure A1.2 - Green Generation Reduction - Interior stream
Flow Duration Curve (08KE024 - Little Swift River at the mouth)