



# QUEEN'S SOLAR DESIGN TEAM

**BIG SPOON LITTLE SPOON – MOBILE COFFEE CART**

PREPARED BY QSDT  
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## Table of Contents

Summary .....	3
Design goals .....	3
Mutual Benefit Agreement .....	4
Queen’s Solar Design Team Expectations.....	<b>Error! Bookmark not defined.</b>
Big Spoon Lil Spoon Expectations.....	<b>Error! Bookmark not defined.</b>
Proposed Design .....	5
Form / appearance .....	5
Function .....	6
Material.....	7
Operation .....	7
Expenses and Budget .....	9
Construction .....	9
Coffee Brewing .....	10
Other Considerations.....	11
regulation .....	11
Operation .....	11
Conclusion .....	12



## Summary

Upon request, QSDT has prepared the design report of a mobile cart for use as a part of BSLS's initiative to operate across Queen's campus and Kingston. The cart's intended purpose is to serve as light traffic coffee business as well as a promotion site for green practices and BSLS' services.

This report contains QSDT's proposed construction and operation design in consideration of both parties' mutual goals. A **detailed cost breakdown** of construction materials with a **maximum total cost** is included along with price options for brewing coffee.

QSDT aims to reduce construction costs by up to 25% with the use of reusable materials found around Kingston and thereby also contribute to the sustainability goal of the design and ensure that it remains in alignment with QSDT's mission for greener building practices.

## DESIGN GOALS

### 1. AESTHETIC

As the public face of BSLS as well as a promotional space for green, minimalist practices, the cart's visual appearance is a primary consideration in its design. The final product will see a clean, simple and functional design that reflects its intended use. Appearance of the cart must also align with BSLS color scheme: **black and yellow**.



### 2. COST

As the first prototype in a new venture, the affordability of the cart is important. Cost will be reduced by using wood as the primary element in the cart as well as using recycled and second-hand materials from Kingston construction sites. BSLS set a maximum operating budget of \$1000 for the cart. QSDT aims to deliver at a much lower price point of \$670.



### 3. PROMOTION OF GREEN PRACTICES

As a part of QSDT and BSLS' mutual goal for a sustainable future, the promotion of green technologies and practices is a key objective. Both cart design, construction and operation will use recycled materials, safe waste management, and responsible product sourcing.



## Mutual Benefit Agreement

Big Spoon Lil Spoon agrees to pay for all costs associated with this project that are listed in this document. For information about the cost of this project, please see the budget section below.

Big Spoon Lil Spoon and the Queen's Solar Design Team both aim to draw mutual benefit from this arrangement. Each party agrees to uphold several terms, which have been omitted from this section for privacy reasons.



# Proposed Design

## FORM / APPEARANCE

The structure of the cart has been made to reflect the design objectives; simple and clean. Basis for the cart's appearance was derived from the *wood and steel* coffee cart seen to the right. The actual coffee cart body will share color and material similarity to this cart with a basic wood body trimmed with black metal edging. Note that colours and actual materials may vary from the example slightly because we aim to integrate the use of upcycled, discarded and found materials.



Figure 1 - Design inspiration for BSLS coffee cart

The designed cart (below left) consists of a rectangular body accentuated with a slanted side and a fold out countertop. Practical additions to the cart include:

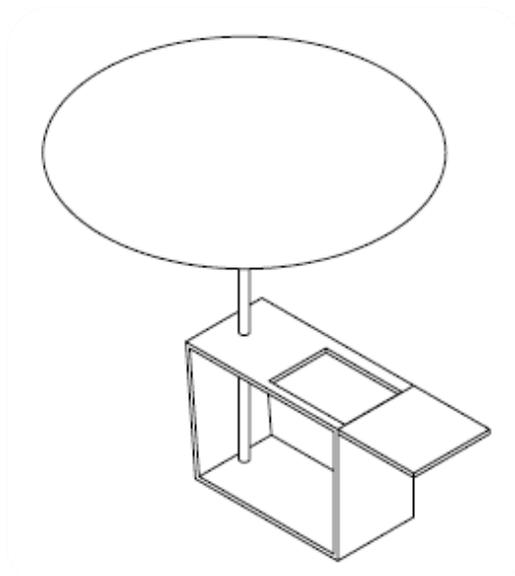


Figure 2 - Form model of the proposed coffee cart

- a 7.5 ft umbrella which will keep workers protected from the worst of the sun while adding to the appeal of the cart
- a cooler built into the counter for ease of access and aesthetic appeal
- a handle to push the cart located opposite the fold out counter.
- Finally, dolly wheels will make the cart mobile and provide brakes to keep the cart stationary.

The cart will stand at 3.5 ft tall with a length of 4 ft (counter-top down). Dimensioned drawings for the proposed cart can be seen below.

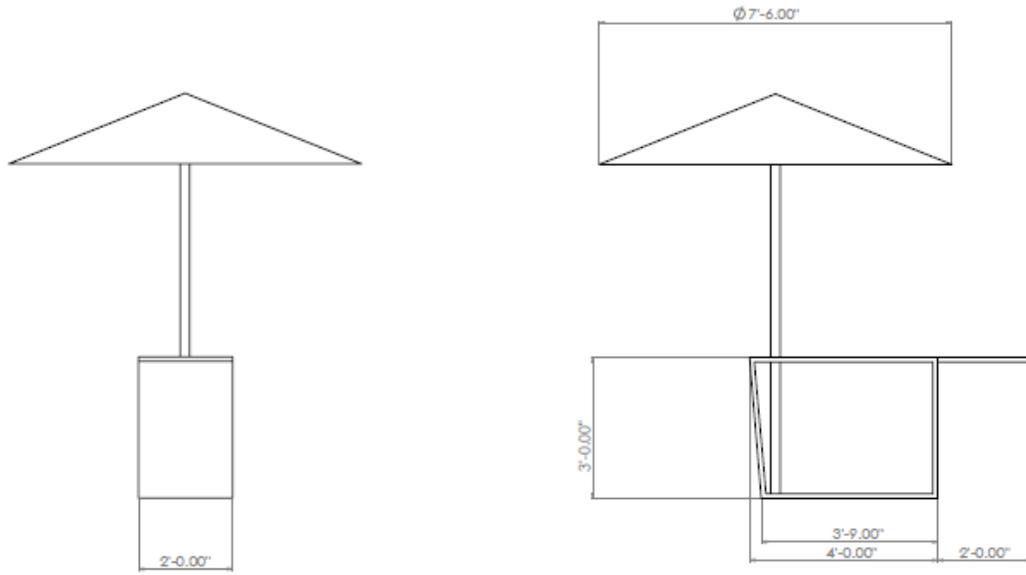


Figure 3 - Dimensioned Drawing of the proposed cart. Dimensions in feet and inches

## FUNCTION

### Cooling capacity:

Planned use of the cart extends to the sale of coffee and premade/package food items. The proposed cooler space stores 36 cans with the vertical space to fit a 2L bottle. This space will be kept at fridge temperatures with the use of ice packed in at the beginning of the day. This should meet the needs of keeping milk, cream and a few food items cool throughout the day.

Potential for upgrade may see a larger cooler installed in the foot of the cart or a second cooler to be used as a freezer space after construction. BSLs is encouraged to confirm their cooler space requirements prior to construction for the best final appearance of the cart.

### Power:

The cart design has also included an electrical supply to power an electric kettle or a coffee machine. An outlet will be attached within the cart. An extension cord will extend the reach of the cart 50 ft from any outlet.

### Mobility:

Mobility of the cart has been designed to meet the short-range needs of BSLs. Rotating wheels will provide both the mobility and braking to reach and operate across campus. Because of the mass of the cart both stairs and longer-range applications will require greater than the manpower of 1-2 people. Although made from relatively light wood, the cart will be heavy at around 200-300 lbs. A truck or large minivan will likely be needed to transport the cart at longer distances while 3-4 people will be needed to comfortably carry the cart up a set of stairs.



Storage:

Storage space in the cart should be sufficient for the water storage tank, a second cooler and miscellaneous supplies. Planned layout of the interior of the cart is subject to the size of these items.

## MATERIAL

Cart materials have been chosen to suit the economic, environmental and aesthetic needs of the BSLS project. Wood boards will be used to construct the frame and body of the cart while a high-grade plywood sheet will serve as the countertop and workspace. Wood stain will be used to protect the cart from the elements improving the longevity of the cart. Black aluminum will frame the body and countertop providing a clean appearance and protecting the cart from bumps.

As a part of the green construction practices, use of recycled/reclaimed material is an intelligent way to reduce the footprint and cost of a design. QSDT has set an optimistic goal to source over 65% of materials from recycled sources. Materials used from the cart will be sourced from second-hand stores such as the Habitat for Humanity Restore and local sources such as the Wolfe island recycling center and Yellow Bike Action where possible. In doing so it is expected that costs for the cart could be reduced by 25% or more.



This process will be highly variable and will inevitably result in design/ appearance modification during the material sourcing phase of the project. Due to the unpredictability associated with obtaining these materials, however, the cart will be designed and priced with “off-the shelf” products.

## OPERATION

### Green Promotion

As part of the shared objective of QSDT and BSLS to make the cart operate sustainably and promote environmentally sustainable practices, the cart should include posters that promote green practices in general, with specific reference to those included in the cart’s design.

3 posters are planned for display advertising the use of sustainable products (eg. Fair trade coffee), reused materials incorporated in the cart’s design, and sustainable power generation (specifically, discussing the footprint of the cart’s operation, and the sources of Ontario’s power generation).

For these 3 posters, which will be appropriately sized to fit tastefully into the cart’s aesthetic, there are 3 placement ideas, as can be seen on the diagram below.



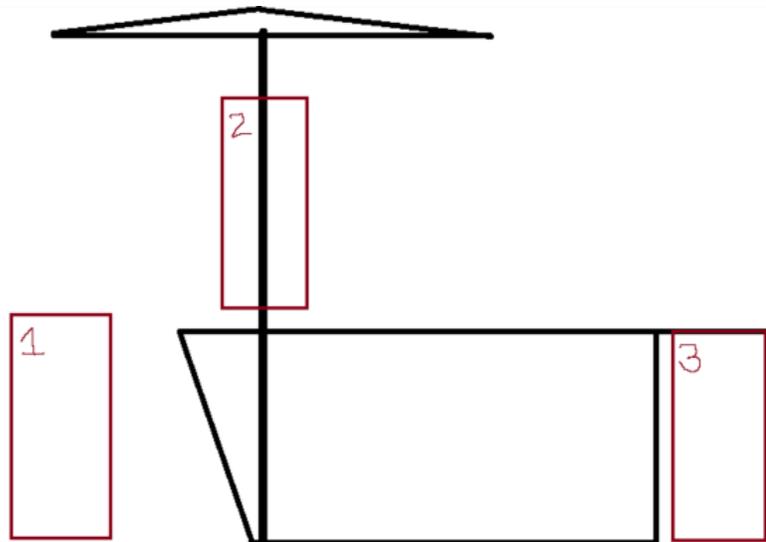


Figure 4: Locations for Promotional Posters (NTS)

1. On a stand-up sign, separate from the cart.
2. Fastened to umbrella pole.
3. Hanging from fold-out counter.

#### Recycling

Promotion of safe recycling practices will be incorporated into the enclosure of the cart. Cart operators should take care to dispose of organic and recyclables waste in the appropriate bins while a sign encourages and shows customers which bins to dispose of their waste in.

#### Sourcing Green Products

Extra expense will be accrued over time in operating with recycled materials and higher quality offerings, like fair trade coffee. However, keeping with the QSDT and BSLS blended goal of making this cart run sustainably, this is seen as a necessary operating cost. Consider the following components of the cart's operation and recommended sources:

##### 1. **Coffee Beans/ milk**

It is recommended that the BSLS coffee cart be branded as a supplier of responsibly sourced drinks. Primarily, the use of fair-trade and certified rainforest alliance coffee beans is recommended. Promotional material will serve to market both the product to customers and the importance of its use in a sustainable future.

Similarly, sourcing food products such as milk from local vendors (Kingston at best, Canada at worst) is the recommended choice. In doing so you are both reducing the carbon footprint of that food product and supporting the regional diversification of the food industry.

## 2. Cups, Lids, Straws

The number one option for reducing waste would be promoting reusable mugs. Principally, BSLS is encouraged to offer discounted coffee if customers bring their own coffee mugs. Alternatively, the use of paper products such as cups and straws would be suit customers who opt out of the incentive. It is recommended that BSLS stay away from plastic lids. However, in using these products proper disposal of the cup to meet Kingston's recycling program should be displayed on the informational poster (i.e. paper cup recycled separate from plastic lids).

## Expenses and Budget

### CONSTRUCTION

With a maximum operating budget of \$1000, QSDT plans to complete the BSLS cart for far less. An initial material cost estimate of the proposed design has been completed sourcing materials from Home-depot, Walmart and Amazon. The complete part and cost list can be seen below. Note; an additional unforeseen cost estimate of \$100 (20%) has been included but will be reimbursed if it is not used.

*Table 1: Cost breakdown of the structural materials for the cart. For exact product links, contact QSDT.*

Part	Price [\$]
<b>frame</b>	
2x4x8	22
<b>body</b>	
1x6x8	85.77
1/4" 4x8 (OSB plywood)	8.77
1/2" x8' metal angle	35.1
brake wheels	20
wheels	18
<b>countertop</b>	
1/4" 4x8 (OSB plywood)	8.77
4x8 0.2 mm plywood	25.1
1/2" x8' metal angle	46.8
hinges 2 pack	15.68
support arm	20
<b>miscellaneous</b>	
screws 50 zinc plated	7.75
Wood stain	25
Cart handle	5.67
Countertop handle	7
<b>accessories</b>	
7.5 ft umbrella	62
28-quart cooler	35
extension cord, 50' 12 gauge	45
<b>unforeseen cost</b>	100



tax	77.14
<b>total</b>	<b>670.55</b>

The completed cost of the cart is conservatively placed at \$670. As previously mentioned, this cost analysis does not foresee the use of recycled materials. Use of these green building materials as intended is likely less expensive and will lower costs. The use of a more environmentally friendly cooler will have a similar effect but has not been finalized due to a shipping issue. QSDT will aim to minimize the cost that BSLs incurs to the best of its ability, and it is in our best interest as well to maintain the integrity of the project by using recycled materials wherever possible and appropriate.

## COFFEE BREWING

The power supply of the cart is sufficient to power **one** kettle **or** coffee machine. A pour-over style Chemex brewer would suit the low traffic needs of the cart. This system uses a kettle to supply the water, and a thermos for backup storage while using the Chemex to brew additional coffee. The kettle could then also be used to brew tea if needed. This method is less expensive and more personal than an industrial sized brewer, and less wasteful than a coffee pod machine as paper filters can be composted while pods are non-recyclable.

Table 2: Cost breakdown of start-up materials required for the pour-over coffee brewing.

Part	Price [\$]	Link
Chemex 10 cup	69.47	<a href="#">Store link</a>
Bonavita BV382518V 1.7 liter	119.37	<a href="#">Store link</a>
2.2-liter Airpot w/ Lever Pump	57.95	<a href="#">Store link</a>
tax	32.08	
<b>total</b>	<b>278.87</b>	



The listed kettle is chosen for temperature control and precision pouring to allow for high quality brewing. However, more standard electric kettles such as the [Sunbeam 1.7L Cordless Kettle](#) for \$32.98 would reduce the price if desired. If BSLs would like to invest the money, another more sustainable addition would be the use of the Able Kone permanent metal filter in place of the disposable paper cone filters. The Able Kone is available through Amazon.ca for \$82.92 but would require cleaning if BSLs has the means to do so.

Table 3: Brewing cost options

With Cheapest Kettle	With Premium Kettle	Premium Kettle + Reusable filter
\$181.25	\$278.87	\$372.57

The average premium kettle option would then bring the total cost of the cart to \$950 at maximum. This makes the coffee production the greatest single expense

## Other Considerations

### REGULATION

While operation and use of the cart is deemed safe by QSDT, it is important that use of the cart for the sale of food in a commercial capacity is deemed appropriate by the responsible regulatory bodies. Regulation will undoubtedly be enforced both by AMS, which governs Queens' clubs and activities, as well as the City of Kingston. BSLs should obtain the appropriate permits and approvals prior to use of the cart.

### OPERATION

An outline of the foreseen operational considerations has been completed for the convenience of BSLs's operation of the cart.

#### Power needs:

As the intended design for the cart will rely entirely on power supplied from a third-party outlet BSLs will be responsible for obtaining reliable access to this electrical supply. It is known that vendors have used electrical power in the past at the intended locations of sale (Stauffer and Mackintosh-Corry). It is also worth noting that cart location will also be limited to within 50 ft of a suitable outlet.

#### Cooling:

As designed the cooler will be kept cool throughout the day with ice or another cold medium. BSLs will require a reliable source of ice to maintain their cooling capacity. As bagged ice presents higher operating costs, it is recommended that a sponsorship is found with one of the local food vendors who will likely possess a large ice machine. Ice will need to be supplied 1-2 times per day to maintain the appropriate temperatures within the cooler. Use of an additional cooler will increase the ice demand of the cart.

#### Storage/transportation:

Both storage and transportation of the cart should be considered by BSLs prior to construction. Although rain/snow should not damage the cart short term, storing the cart outside will decrease the lifetime and is not recommended. BSLs will be responsible for allocating storage space for the cart. The cart will be built in the ILC and will be able to be moved around campus with muscular power. However, both stairs and long-range transportation will present problems for the operators of the cart. The cart is not made to be towed and will require hauling for longer distance transportation.



## Conclusion

QSDT has proposed a design to meet the needs of Big Spoon Little Spoon for their mobile coffee cart. To meet the mutual goals of BSLS and QSDT the recommended operation and construction of the cart has also been attached.

Current design estimates place the maximum construction cost including the recommended coffee machine at \$900. It must be noted that this conservative analysis does not include the reduction in cost from the use of recycled material or the potential for sponsorship and donation of material/appliances. BSLS is highly encouraged to seek out a donor for their coffee production. As the single greatest expense, this could reduce costs by up to \$280.

Moving forward, QSDT asks for the feedback of BSLS regarding the design or any possible updates regarding the needs of the club. We welcome any changes to this document up to and including the project commencement date of Monday, June 24. After this date, construction will begin and any changes to design or budget will only be made at the discretion and consensus of both parties. QSDT will also begin purchase of materials on this date.

Should the cart suit the needs of BSLS, QSDT will move forward in searching for recyclable materials and commence construction on the design.

