

## **Exhibit B**

# **2021 Lake Earl Entrance Maintenance Dredging – Spoil Volume Calculations**

See document posted as Exhibit B on [www.fwb.org/rfps](http://www.fwb.org/rfps) or at  
[www.BidNetDirect.com](http://www.BidNetDirect.com).

**CITY OF FORT WALTON BEACH, FLORIDA  
MEMORANDUM**

**Date:** February 02, 2021  
**To:** File  
**Subject:** 2021 Lake Earl Entrance Maintenance Dredging – Spoil Volume Calculations

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**Variables**

*V = Volume of Spoils*  
*L = Distance between Stations*  
*A = Cross – Sectional Area*  
*h = Depth of Extent of Dredging*  
*a = Width of Channel at Existing Bottom Elevation*  
*b = Width of Channel at Dredged Bottom Elevation*  
*e = Elevation*

**Equations**

$$V_T = \sum V$$
$$V = \frac{L(A_1 + A_2)}{2}$$
$$A = \frac{1}{2}h(a + b)$$
$$h = e_2 - e_1$$

**Calculations**

$$e_{1(10+00)} = -5.00 \text{ ft}$$
$$e_{2(10+00)} = -4.16 \text{ ft}$$
$$h_{(10+00)} = -5.00 \text{ ft} - -4.16 \text{ ft}$$
$$h_{(10+00)} = 0.85 \text{ ft}$$
$$a_{(10+00)} = 42.50 \text{ ft}$$
$$b_{(10+00)} = 39.14 \text{ ft}$$
$$A_{(10+00)} = \frac{1}{2} \times 0.85 \text{ ft} \times (42.50 \text{ ft} + 39.14 \text{ ft})$$
$$A_{(10+00)} = 34.29 \text{ ft}^2$$

$$\begin{aligned}
e_{1(10+55)} &= -5.00 \text{ ft} \\
e_{2(10+55)} &= -3.06 \text{ ft} \\
h_{(10+55)} &= -5.00 \text{ ft} - -3.06 \text{ ft} \\
h_{(10+55)} &= 1.94 \text{ ft}
\end{aligned}$$

$$\begin{aligned}
a_{(10+55)} &= 33.00 \text{ ft} \\
b_{(10+55)} &= 25.24 \text{ ft} \\
A_{(10+55)} &= \frac{1}{2} \times 1.94 \text{ ft} \times (33.00 \text{ ft} + 25.24 \text{ ft}) \\
A_{(10+55)} &= 56.49 \text{ ft}^2
\end{aligned}$$

$$\begin{aligned}
L_{(10+00 \text{ to } 10+55)} &= 55 \text{ ft} \\
V_{(10+00 \text{ to } 10+55)} &= \frac{55 \text{ ft} \times (34.29 \text{ ft}^2 + 56.49 \text{ ft}^2)}{2} \\
V_{(10+00 \text{ to } 10+55)} &= 2,496.49 \text{ ft}^3
\end{aligned}$$

$$\begin{aligned}
e_{1(11+09)} &= -5.00 \text{ ft} \\
e_{2(11+09)} &= -3.26 \text{ ft} \\
h_{(11+09)} &= -5.00 \text{ ft} - -3.26 \text{ ft} \\
h_{(11+09)} &= 1.74 \text{ ft}
\end{aligned}$$

$$\begin{aligned}
a_{(11+09)} &= 38.30 \text{ ft} \\
b_{(11+09)} &= 31.34 \text{ ft} \\
A_{(11+09)} &= \frac{1}{2} \times 1.74 \text{ ft} \times (38.30 \text{ ft} + 31.34 \text{ ft}) \\
A_{(11+09)} &= 60.59 \text{ ft}^2
\end{aligned}$$

$$\begin{aligned}
L_{(10+55 \text{ to } 11+09)} &= 54 \text{ ft} \\
V_{(10+55 \text{ to } 11+09)} &= \frac{54 \text{ ft} \times (56.49 \text{ ft}^2 + 60.59 \text{ ft}^2)}{2} \\
V_{(10+55 \text{ to } 11+09)} &= 3,161.15 \text{ ft}^3
\end{aligned}$$

$$\begin{aligned}
e_{1(11+35)} &= -5.00 \text{ ft} \\
e_{2(11+35)} &= -2.06 \text{ ft} \\
h_{(11+35)} &= -5.00 \text{ ft} - -2.06 \text{ ft} \\
h_{(11+35)} &= 2.94 \text{ ft}
\end{aligned}$$

$$\begin{aligned}
a_{(11+35)} &= 35.50 \text{ ft} \\
b_{(11+35)} &= 23.74 \text{ ft} \\
A_{(11+35)} &= \frac{1}{2} \times 2.94 \text{ ft} \times (35.50 \text{ ft} + 23.74 \text{ ft}) \\
A_{(11+35)} &= 87.08 \text{ ft}^2
\end{aligned}$$

$$L_{(11+09 \text{ to } 11+35)} = 26 \text{ ft}$$

$$V_{(11+09 \text{ to } 11+35)} = \frac{26 \text{ ft} \times (60.59 \text{ ft}^2 + 87.08 \text{ ft}^2)}{2}$$

$$V_{(11+09 \text{ to } 11+35)} = 1,919.70 \text{ ft}^3$$

$$e_{1(11+64)} = -5.00 \text{ ft}$$

$$e_{2(11+64)} = -2.56 \text{ ft}$$

$$h_{(11+64)} = -5.00 \text{ ft} - -2.56 \text{ ft}$$

$$h_{(11+64)} = 2.44 \text{ ft}$$

$$a_{(11+64)} = 45.40 \text{ ft}$$

$$b_{(11+64)} = 35.64 \text{ ft}$$

$$A_{(11+64)} = \frac{1}{2} \times 2.44 \text{ ft} \times (45.40 \text{ ft} + 35.64 \text{ ft})$$

$$A_{(11+64)} = 98.87 \text{ ft}^2$$

$$L_{(11+35 \text{ to } 11+64)} = 29 \text{ ft}$$

$$V_{(11+35 \text{ to } 11+64)} = \frac{29 \text{ ft} \times (87.08 \text{ ft}^2 + 98.87 \text{ ft}^2)}{2}$$

$$V_{(11+35 \text{ to } 11+64)} = 2,696.30 \text{ ft}^3$$

$$e_{1(11+90)} = -5.00 \text{ ft}$$

$$e_{2(11+90)} = -2.56 \text{ ft}$$

$$h_{(11+90)} = -5.00 \text{ ft} - -2.56 \text{ ft}$$

$$h_{(11+90)} = 2.44 \text{ ft}$$

$$a_{(11+90)} = 52.50 \text{ ft}$$

$$b_{(11+90)} = 42.74 \text{ ft}$$

$$A_{(11+90)} = \frac{1}{2} \times 2.44 \text{ ft} \times (52.50 \text{ ft} + 42.74 \text{ ft})$$

$$A_{(11+90)} = 116.19 \text{ ft}^2$$

$$L_{(11+64 \text{ to } 11+90)} = 26 \text{ ft}$$

$$V_{(11+64 \text{ to } 11+90)} = \frac{26 \text{ ft} \times (98.87 \text{ ft}^2 + 116.19 \text{ ft}^2)}{2}$$

$$V_{(11+64 \text{ to } 11+90)} = 2,795.80 \text{ ft}^3$$

$$V_T = 2,496.49 \text{ ft}^3 + 3,161.15 \text{ ft}^3 + 1,919.70 \text{ ft}^3 + 2,696.30 \text{ ft}^3 + 2,795.80 \text{ ft}^3$$

$$V_T = 13,069.44 \text{ ft}^3 \times \left(\frac{1 \text{ yd}}{3 \text{ ft}}\right)^3$$

$$V_T = 484.05 \text{ yd}^3$$

$$V_T \approx 485 \text{ yd}^3$$