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$2& ([LVWLQJ &RUUHFWLYH 0HDVXUH 6\VWHP *&76

7KLV VHFWLRQ SUHVHQWV WKH WHFKQLFDO RYHUYLHZ DQG ILQGLQJV IR
FRQGXFWHG WR GHNHHG 0DUWLQ)3'U;RDQW3DQWKHU 2UGHU
$5&$',6 1<6'(& UHVSHFWLYHO\ DFWLYH &RUUHFWLYH -XO\ DV
SDUW RI WKH LQYHVWLJDWLRQ RI $2&

- 6KXWGRZQ WHVWLQJ RI WKH *&76
- &RQWLQXRXV ORJJLQJ RI WKH ZDWHU WDEOH DW VL[SLH]RPHWHU
  VKXWGRZQ DQG UHVWDUW SHULRGV DQG
- 0DQXDO PHDVXUHPHQWV RI WKH ZDWHU WDEOH DW SLH]RPHWHU
  VKXWGRZQ SHULRG

7KHP HDVXUHPHQWV FROOHFWHG IURP WKH WUDQVGXFHU PRQLWRULQJ DQ
OHYHO PRQLWRULQJ DQG DSURYLGHG WR GHQLGH)LQGXUHVSHFWLYHO\

$2& 7HFKQLFDO 2YHUYLHZ

7KH *&76 ZKLFK HQDEOHG DV DQ ,&0 VLQFH ZDV IXUWKHU HYDO
FRQILUP WKDW WKH QRUPDOLQHG GUDZGRZQ LQ WKH ZHOO\LQGLFDWHV
LQWHUFHSWLQJ JURXQGZDWHU 7KH HYDOXDWLRQ FRQVLVWHG R
JURXQGZDWHU HOHYDWLRQ IURP SUHVVXUH]RPHWHUV DQG PRQLWRULQJ ZHOOV
XQGHUDLQ WR HVWDEOLVK WKH JURXQGZDWHU FRQILJXUDWLRQ GXULQJ
WKHVH GDWD ZHUH FROOHFWHG WKURXJK *&76 6HUYLFHV DQG GRZQ WR HYDOXDWH
JURXQGZDWHU UHFRYHU\ DQG LQWHUIHUHQFH EHWZHHQ WHVWLQJ

&RQWLQXRXV JURXQGZDWHU HOHYDWLRQ PHDVXUHPHQWV ZHUH FROOHF
ORFDWLRQV XVLQJ LQVWDOOHG SUHVVXUH]RPHWHUV DQG JURXQGZDWHU
KRXUV)RXU URXQGV RI PDQXDO JURXQGZDWHU PHDVXUHPHQWV
GXULQJ WKH ILUVW KRXUV RI WHVWLQJ DQG DW VHOHFWHG LQWHUYDOV
$IWHU KRXUV RI VKXWGRZQ LQ WKH ZHOO\ DQG GXULQJ D ILIWK URXQG
RI PDQXDO JURXQGZDWHU HOHYDWLRQ PHDVXUHPHQWV ZDV FRQGXFWHG D
ZDV UHVXPHG DW D WRWDO SXPSDJH RI JSP

7KH V\VWHP ZDV UHVWDUWHG IROORZLQJ D VKXWGRZQ SHULRG 7KH GDWD
PRQLWRULQJ FRQWLQXHG IRU DSSUR[LPDWHO\ WKUHH PRQWKV
HYDOXDWLRQ DQG LQFOXGHG \RXQJ KRXUV

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6ROYHQW 'RFN $UH

VDWLVI\ WKH 7KLHQH 5XOH UHVSRQVH DFWLRQV WR EH FRQVLGHUHG IRU H
DUHD RI FRQFHUQ 1R ' LQFRUSRUDWHG LQ

$2& ±JURXQGZDWHUDQGHDV

- x 1R DFWLRQ
- x 01$
- x 5HPRYDO RI FRQWD JURXQGZDWHU
- x ([VLWX HDWPHQW F FRQWDPLQDWHG JI
- x ,QVLWX HDWPHQW R FRQWDPLQDWHG VI
- x ,QVLWXWPHQW RI FRQWDPLQDWHG J
- x &RQWDLQPHQW RI JURXQGZDWHU
- x ' LVFKDUJH RU GL\ FRQWDPLQDWHG J RWKHU PHGLD

$2& ±VRLO $UHD

- x 1R DFWLRQ
- x 01$
- x 5HPRYDO RI FRQWD
- x ,QVLWX HDWPHQW R FRQWDPLQDWHG VI
- x ,QVLWXWPHQW RI VRLO
- x &RQWDLQPHQW RI VRLO
- x ' LVSRVDO RI FRQ\

7HFKQLFDO ,PSOHPHQWDELOLW\ DQG (IIHFWLYHQHVV

7HFKQLFDO LPSOHPHQWDELOLW\ FRQVLGHUDWLRQV LQFOXGH WKH SUHOLPLQDU\ VFUHHQLQJ FULWHULD RU FULWHULD E\ ZKLFK WHFKQRORJLHV DQG SURFHVV RSWLRQV 7HFKQLFDO LPSOHPHQWDELOLW\ FRQVLGHUDWLRQV DOVR LQFOXGH WKH &RQVLGHUDWLRQ RI VSHFLILF FRQGLWLRQV VXFK DV WKH JHRORJLF DQG KHWLQJ DQG FRQWDPL FRQWDPLQDQW F7KH UHPHGLDWLRQ WHFKQRORJLHV DQG SURFHVV IRU WKH)13' FRQVLGHUHG DYDLODEOH WHFKQRORJLHV WR FRPSLOH D OLVW RI UHWD SURFHVV RSWLRQV WHFKQLFDOO\ FDSDEOH RI GGUHVVLQJ FRQWDPLQD)13' XQGHU FXUUHQW VLWH FRQGLWLRQV

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6WXG\ 5HSRUW

6ROYHQW 'RFN $UH

7DEOHV DQG SUHVHQW WKH SUHOLPLQDU\ HYDOXDWLRQ RI WHFKQRORJLHV WHFKQLFDO LPSOHPHQWDWLRQ RU $2& HVSHFWLYHO\
7KHVH WDEOHV EULHIO\ GHVFULEH SRWHQWLDOO\ DSSOLFDEOH WHFKQRORJLHV DVVRFLDWHG ZLWK WKH SURFHVVH DFWLRQV DQG SURYLGH GHWDLOHG VFUHHQLQIRUPDWLRQ

(YDOXDWLRQ RI 3URFHVV 2SWLRQV

$IWHU WKH WHFKQLFDO LPSOHPHQWDWLRQ RU $2& HVSHFWLYHO\ WKH UHWDLQHG WHFKQRORJLHV DQG SURFHVV RSWLRQV DUH HYDOXDWHG LQ GHWDLO X\

- (IIHFWLYHQHVV
- 5HODWLYH FRVW
- ,PSOHPHQWDELOLW\

7KH HIIHFWLYHQHVV RI WHFKQRORJLHV DQG SURFHVV RSWLRQV LV HYDO DV IROORZV

- 3RWHQWLDO HIIHFWLYHQHVV LQ DGGUHVVLQJ WKH HVWLPDWHG DUI PHGLD DQG PHHWLQJ WKH 5*&V
- 3RWHQWLDO HIIHFWV RQ KXPDQ KHDOWK RU WKH HQYLURQPHQW GX LPSOHPHQWDWLRQ DQG
- 3URYHQ UHOLDELOLW\ RI WKH SURFHVV ZLWK UHVSHFW WR WKH W\ VLWH FRQGLWLRQV

,PSOHPHQWDELOLW\

,K UH PD... G @W

R H I UI PI WQ@pÀY

7KHSDOLFDWLRQ RI 01$ WDNHV DGYDQWDJH RI QDWXUDO SURFHVVHV WR
FRQFHQWUDWLRQV 7KH RQO\ LQIUDVWUXFWXUH UHTXLUHG LV DQ DGHTX
7KLV QHWZRUN LV DOUHDG\ LQ SODFH DQG RSHUDWLRQDO
UHTXLUHG IRU WKHVH SURFHVVHV WR ORZHU FRQWDPLQDQW FRQFHQWU
RI KXPDQ KHDOWK DQG WKH HQYLURQPHQW DW OHYHOV ZHOO EHORZ
V\VWHPV DQG GLIIHUHQW FKHPLFDO FRQWDPLQDQWV

$Q LQLWLDO HVWLPDWH RI TXDUWHUO\ RSHUDWLQJ FRVWV IRU WKH)13'
1RYHPEHU WR HVWDEOLVK JURXQGZDWHU FRQGLWLRQV DQG WR GHWHUPLQH
FRQGLWLRQ IRU 2FWREHU SDUDPHWHUV DUH HVWDEOLVK
VHDVRQDO JURXQGZDWHU XQGHUVWRRG WKH)13'
UHGXFHG WR D PRUH VLJQLILFDQW QXPEHU RI \HDUV
DUH DFKLHYDEOH RI KRZ 01$ PLJKW FRQWULEXWH WR OLYH
DOWHUQDWLYH IRU XQGHUVWDQGLQJ DQG

- 5HPHGLDWLRQ RI ORZ OHYHOV RI 92&V UHPDLQLQJ DIWHU DSSOLFDV
  UHPHGLDWLRQ DOWHUQDWLYH

- 5HPHGLDWLRQ RI ORZ OHYHOV RI 92&V LQ DUHDV ZKHUH DFWLYH UI
  SURYLGH OLPLWHG DGGLWLRQDO SURWHFWLRQ RI KXPDQ KHDOWK D
  DGGLWLRQDO UHGXFWLRQ LQ FOHDQXS SHULRGV DQG

- *URXQGZDWHU PRQLWRULQJ WR HQVXUH WKDW 92&V GR QRW PLJUD

01$ IRU)13' $UHDV XQGZDWHU U6HPHGLDO 6 3URGXFWLRQ 6HWWLQJ HIIHFWLYHQHVV U
LPSOHPHQWDELOLW\WRQHUDQGH´DFRVWZ UDWLQJ 7DEOH

&RQWDLQPHQW *URXQGZDWHU 5HFRYHU\ 7UHQFKHV

$V GLVFXVVHG 6H P0ÀQ v6 6v 6v 6 Q g‘—‘

([VLWX 3K\VLFDO 7UHDWPHQW – 9DSRU 3KDVH &DUERQ $GVRUSWLRQ

([VLWX SK\VLFDO WUHDWPHQWDW VLRQ\SRWOYHHK PDHKHLDXDQHXRIDDQG
DFWLYDWHG FDUERQWK*L$& WULHDWPHQWW WKURXJK D VHULHV RI FDQLV
RU FROXPQV FRQWDLQLQJ DFWLYDWHGLQ FDUERQDSRE ZKLFHDRUJDQLF &2&
DGVRSWLRQ LQYROYHV&2&RQ YHKUHVLEXO\DFHQGLQJ VRUEHQW
PDWH3UHLDORGLF UHSODFHPHQW RU UHJHQHUDW*L&QLI VDWXUDWHG FDUE
HIIHFWLYH LQ WUHRYLQQ3D&V D FRPPRQWHWKRG W YDSRU
93*$&UHFHLPYRHGHÚDHWHFWLYHQHVV ³KLDQG P³SRZHP HQWD
PRGHÚDFWLW UDWLQJV 7DEOH

C0€ULHÀ'LVWLEXWHGJHQHUDWLRqpUÓPHÆDEHU 'LVFKDUJH

6XUIDFH ZDWHU GLÀ0 7DEOBb7 FKP‰0€ìo WH

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6WXG\ 5HSRUW
6RLYHQW 'RFN $UH

LQFUHDVH ,I WKH VRLO LV QRW FDXVRQQFJHQQWQQWLRQVH LQ JURXQGZDWH
LQVWHDG D GHFUHDVLQWKWQHQGHLFKDEQJHUVYLHG JURXQGZDWHU FRQFHQWU
FDQ EH XTVHGQWR I\ DWWHRQXDWKLRQDVDWLQV DOO PHGLD ZLWKLQ WKH DUHD
VRLO JURXQGZDWHWRLQWYDSRU

0DVV ZLWKLQHQDQHDWR DD VWDWH RI HTXLOLEULXP EDVHG RQ WKH FKHPLFI
RI WKH &2& WKH DPRXQWRQWKHDQGWKHPSHUG RI FRQWDFW
%HFDXVH RIKWGKUDXORZF FRQWKHWLRLW ZLWKLQHWKH DQHWLVH)1RQJ
SHULRG RI FRQWDFW EHWZHHQ WKH WKLOSDQGFRQGWDFWRUQGZDWHU 'XUL
WKH PDVV SUHVHQW HLWKWRWQGRPWKH VEHRQGKDWHUO
RUGLVVROXWLRQURWKHRQWKHUJURXQGZDWHU XQWLO WKH WZR KDYH UHD
VWDWH RI HTXLOLEULXP EDVHG RQ WKH*SYHUQWDWKLWKQJ FRHIILFLHQW RI
FRQFHQWUDWLRQ LQHWFKHDLWRXLQFGZDWHWK DWLQ FRQFHQWUDWLRQ
VXUURXQGLQJUHPRLGHFUHDVLQJ

,Q FHUWDLQ FDVHGGPLRQDERQDPHQXFKDV ELRJHRFKHPLFDO
SDUDPHWWKLQ WKH JUDQXEGZRWKHUXFWKLQWH SURFHVVHV
PD\ EH UHVSRQVLEOH IRU WKH REVHUYHG DWWHQXDWLRQ DQG WR GHPR
WK&H2& 01$ FDQVWHDQGRQHFKQRORSHQGHQW EHIRUH GXULQJ RU
IROORZLQJ PRUH DJJUHVSLYRXHDBMXWRKHQLILFDQW
VKRWWUP UHGXFWLGSQKDVHDEYDVEH01$ IRUp)13' $UHD

QHWZRUN 7KH UHODWLRQVKLSV EHWZHHQ VSHFLHV LQ WKH HFRV\VWHP DUH FRPSOH[DQG LQWHUGHSHQGHQW
$UHDV WR HQKDQFH WKH FXUUHQW 2V0VFRPSRVLWLRQ EH ORZ EHFDXVH
UHFRYHUDEOH UZYROXPHV DUH ORZ VHH 7DEOH

5HPRYDO ([FDYDWLRQ DQG 'HZDWHULQJ

([FDYDWLRQ DQG GHZDWHULQJ YROXPHV IRU WKH SURSRVHG PHGLD YLD
VWDQGDUG H[FDYDWLRQ SUDFWLFHV DQG WHFKQRORJ\ 7\SLFDO HTXLSP

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6WXG\ 5HSRUW

6ROYHQW 'RFN $UH

WDNHQ $YHWHGRHDWQRWKHHVW&V HVWDEOLVKHQWKH
WKUHVKROG FULWHULD

$OWHUQDWLYH 2SHUDWLQJ RI WKH *&76 ,QVWLWXWLRQDO &RQWU

$OWHUQDWRYHLQHV WKH H[LVWLQJ WUHQFK QHWZ I
WY0¡ &6HGW UÐpG0ÀXFW0XDW ¥PQ$P FTÀSW-O°L#ÈDn ÐU!–Ð „#7&WY00

$OWHUQDWLYH0HÀH”Àp= P0À#7&yDRH X

&RUUHFWLYH 0H
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6RQRPD &RXQW\ &DOLIRUQLD

)LQDO 5HSRUW

)RU WKH &RQWUDFW RI %RDUG RI 6XSHUYLVRUV &RQWUDFW 1R 6'&(DQG GHJUDGDWLRQ RI 9& IROORZLQJ &RQWUDFWRU¶V GHIDXOW DQG WHUPLQDWLRQ RI WKH &RQWUDFW SURGXFW RI UHPDLQLQJ EDODQFH 67$7(0(17 2) 7+(&217529(56< 7KLV GRFXPHQW DWWHPSWV WR 2UJDQL]H ZRUN LQ WKLV DUHD 4XDUWHUO\ UHSRUWLQJ SHULRGV DUH ZRUN WR 2UJDQL]H ZRUN WKH HDVRQDO YDULDWLRQ LQ FRQWUDFWRU ZRUN DQG WKH 0RQLWRULQJ 3HULRG 6XEPLWWHG WR 1<6'(& ZRXOG EH UHYLVHG WR SURJUHVV RI JURXQGZDWHU FRQGLWLRQV WRZDUG WKH

$OWHUQDWLYHV WR WKH 5*&V HVWDEOLVKHG DQG WKH WKUHVKROG FULWHULD WR

- 3URWHFW KXPDQ KHDOWK DQG WKH HQYLURQPHQW
- $WWDLQ HQYLURQPHQWDO PHGLD WDUJHW FOHDQXS OHYHOV VHOH FRUUHFWLYH PHDVXUHV VHOHFWLRQ
- &RQWURO WKH VRXUFH V RI UHOHDVH V WR UHGXFH RU HOLPLQDW H[WHQW SUDFWLFDEOH IXUWKHU UHOHDVHV RI KD]DUGRXV ZDVWH FRQVWLWXHQWV WKDW PLJKW SRVH D WKUHDW WR KXPDQ KHDOWK DQG
- 0HHW DOO DSSOLFDEOH ZDVWH PDQDJHPHQW UHTXLUHPHQWV

$UHD &RUUHFWLYH 0HDVXUH $OWHUQDWLYHV

7KH IROORZLQJ FRUUHFWLYH DFWLRQ DOWHUQDWLYHV ZHUH GHYHORSHG DQG HYDOXDWHG)13' JURXQGZDWHU FRQWDPLQDQWV DQG SRWHQWLDO DSSOLFDEOH RU UHOHYDQW & FRQFHQWUDWLRQV LQ H[FHVV RI 1<6'(& 6*9V DQG $UHDV RI &RQFHUQ DUH DOVR SUHVHQWHG DV KDYLQJ SRWHQWLDO &2& FRQFHQWUDWLRQV H[FHHGLQJ 3*6&2V DUH HVWDEOLVKHG EDVHG RQ LQWHUSUHWDWLRQ RI &2& FRQWULEXWH WR JURXQGZDWHU FRQWDPLQDWLRQ ZLWKLQ $UHD KDV &2& H[FHHGDQFHV FRQFHQWUDWLRQV JUHDWHU WKDQ WKH HTXLOLEULXP LQ FRQFHQWUDWLRQ EHWZHHQ WKH JU WKH VRLO GHWHUPLQH LI WKH PDVV ZLWKLQ WKH VRLO QHHGV WR EH DG FRQFHQWUDWLRQV LQ WKH JURXQGZDWHU LQGLFDWH WKDW WKH VRLO L ZLOO LQFRUSRUDWH FRQFHQWUDWLRQV

%DVHG RQ WKH HDUO\ JURXQGZDWHU DQDO\WLFDO GDWD DQG SRWHQWLDO SDUWLDO GHFKORULQDWLRQ DW

FRQFHQWUDWLRQ RI WKH SDUHQW FRPSRXQGV SUHVHQW LQ FUHDVHV L
7KH SUHVHQFH RI WKHVH FRPSRXQGV LQGLFDWHV WKDW QDWXUDO DWWH
GHJUDGDWLRQ HQGHDYRXUV LQ WKLV DUHD 4XDUWHUO\ 01$ PRQLWRULQ
FRQWLQXH WR DVVHVV WKH JURXQGZDWHU TXDOLW\ DQG FRQILUP
GHFKORULQDWLRQ LV FRQFHQWUDWLRQ LV XQG
WKH@F DWHDFVHÀHQ"S SHUBQGWGpÃc @M W @ € T@Ì ` „ X @ ° P 4@ p ZRXOG
, @ G Ð V Q

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$OWHUQDWLQJ &RQWLQXHG 2SHUDWLRQ RI WKH *&76 ,QVWLWXWLRQDO &RQWU

$OWHUQDWLQJ FXUUHQW RSHUDWLRQ RI WKH *&76 WUHQFK QHWZRUN DW W
LPSOHPHQW 01$ DV GLVFXVVHG LQ

&RUUHFWLYH 0
6WXG\ 5HSRUW

6XVWDLQDELOLW\

$QDO\VLV VXSSRUWV WKH DELOLW\ RI 6ROYHQW 'RFN $UHQD WR PHHW WKH UHTXLUHPHQWV RI *&76 RSHUDWLRQ
UHTXLUHV WKH H[WUDFWLRQ RI FRQVLGHUDEOH DPRXQWV RI JURXQGZDWHU
FRQVXPSWLRQ WR SURYLGH K\GUDXOLF FRQWURO RSHUDWLRQV DQG FRROLQJ
ODUJHSRZHUHG HTXLSPHQW IRU VKRULQJ DFWLYLWLHV
ZRXOG EH JDWKHUHG LQIRUPDWLRQ RQ WKH SRWHQWLDO IRRWSULQW FUHDWHG WKURXJK W
LPSOHPHQWDWLRQ DQG FRQVWUXFWLRQ DFWLYLWLHV
FRQVXPSWLRQ DQG ZDVWH JHQHUDWLRQ DQG SURSRVDOV RQ KRZ WR PLQLPLVH DFWLYL
H[SHFWHG UHFWLYHUHG LQIRUPDWLRQ RQ WKH HQYLURQPHQWDO EXUGHQ RI
FRUUHFWLYH PHDVXUHV DQG WKH KHDOWK DQG VDIHW\ ULVNV DVVRFL

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/RQJ7HUP (IIHFWLYHQHVV

/RQWHUP HIIHFWLYHQHVV DQG SHUPDQHQFH ZRXOG QRW EH DFKLHYHG W
DFWLRQ´ DOWHUQDWLYH EHFDXVH LQWHUYHQWLRQV [LQWLQRXQGZDWHUQRWG QRW W I EY

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&RVW

1R FRVW DVVRFLDWHG ZLWK WKH ³QR DFWLRQ´ DOWHUQDWLYH EHFDXVH Q
ZRXOG EH SHUIRUPHG

$OWHUQDWLYH &RQWLQXHG 2SHUDWLRQ RI WKH *&76 ,QVWLWXWLRQDO &RQWU

$OWHUQDWLYH RSHUDWLRQ RI WKH 1*&'76 WUHQFK QHWZRUN LQ WK
FRQWLQXHV LQVWLWXWLRQDO RSHUDWLRQV DW WKH VDPH OHYHO DV
GHWDLOHG EHORZ DOWHUQDWLYHV DUH GHVFULEHG LQ WKH
IROORZLQJ VHFWLRQV

/RQJ7HUP (IIHFWLYHQHVV

1DWXUDO DWWHQXDWLRQ SURFHVVHV DQG WUHDWPHQW RI H[WUDFWHG
ORQJ7HUP HIIHFWLYHQHVV 7KH 1*&'76 PRGHO VLPXODWHV WKH
JURXQGZDWHU LQWHUDFWLRQV XQGHU D FORVHG 1<6'(& 6*9V DU
DFKLHYHG 7KH &2&UHPRYHG E\ WKH JURXQGZDWHU H[WUDFWLRQ V\VWHP ZRXOG
SHUPDQHQWO\ WUHDWHG ZLWK EDQUHPRYHG E\ WKH JURXQGZDWHU
YDSRU VWUHDP 7UHDWHG HIIOXHQW ZRXOG EH GLVFKDUJHG WR VXUIDF

7KH PRQLWRULQJ SURJUDP ZLWK WKH ORZ SHUPHDELOLW\ RI WKH JHRORJ
LQ UHODWLYHO\ VORZ JURXQGZDWHU PRYHPHQW DQG UHODWLYHO\ WR
FKDQJLQJ FRQGLWLRQV WKDW PD\ RFFXU LQ WKH IXWXUH 7KH ORZ SHUP
DQG *&76 XQGHUZLQH LQWHUFHSWV WR PRQLWRU WKH HIIHFWLYHQHVV
WKH SRWHQWLDO PRYHPHQW RI FRQWDPLQDQWV 3XPS $QG 7UHDW V\VWHP
QHLJKERULQJ SURSHUW\ RZQHUV LV QRW D UHDVRQDEOH FRQFHUQ EHFD
EH XVHG DV D ZDWHU VRXUFH

7KH UHOLDELOLW\ RI 6

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6KRUW 7HUP (IIHFWLYHQHVV

$OWHUQDWLYH GLQYROYH QR DGGLWLRQDO SKDUPDFRORJLF WUHDWPHQW
H[SRVXUH ULVNV WR KXPDQ KHDOWK RU WKH HQYLURQPHQW
SRVW-LJKHU ULVNV WR KHDOWK RU WKH HQYLURQPHQW RI DVFDOH IXHO
6 @PHUHG FRQVWUXFWLRQ HTXLSPHQW GXULQJ WKH H[FJV

&RUUHFWLYH 0
6WXG\ 5HSRUW
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$5&$',6 $GGHQGXP)1R 2WKHU 9, 3DWKZD\ (YDOXDWLRQ)RUPHU /RFNKHHG 0DUWLQ)UHQFK 5RDG)DFLOLW\ 8WLFD 1HZ <RU

$5&$',6 D&RUUHFWLYH 0HDVXUHV 6WXG\ 5HSRUW IRU WKH 6ROYHQW 'R)RUPHU /RFNKHHG 0DUWLQ)UHQFK 5RDG)DFLOLW\ 8WLFD 1HZ <RU

$5&$',6 E 6LWH 0DQDJHPHQW &RQWURO 6ROYHQW 5HFRYHU\ $UHD)RUPHU /RFNKHHG 0DUWLQ)UHQFK 5RDG <RUN)DFLOLW\ 8WLFD 1HZ

$5&$',6)RUPHU 1RUWKHUQ 3HULPHWHU 'LWFK 6XSSOHPHQWDO ,QYH 3ODQ)RUPHU /RFNKHHG 0DUWLQ)UHQFK 5RDG)DFLOLW\ 8WLFD 1HZ -DQXDU\

$5&$',6 D)RUPHU 1RUWKHUQ 3HULPHWHU 'LWFK 6XSSOHPHQWDO ,QY 5HSRUW 6ROYHQW 5HFRYHU\ $UHD)RUPHU /RFNKHHG 0DUWLQ)UHQFK 5RDG)DFLOLW 8WLFD 1HZ <RUN 0DUFK

$5&$',6 E)RUPHU 1RUWKHUQ 3HULPHWHU ,QWHUFHSWRU 'LWFK 2SHUDWLRQ 3DWKZD\ (YDOXDWLRQ :RUN 3ODQ 6ROYHQW 'RFN $UHD)RUPHU /RFNKHHG 0 5RDG)DFLOLW\ 8WLFD 1HZ <RUN

$5&$',6 F)RUPHU 1RUWKHUQ 3HULPHWHU 'LWFK)HDVLELOLW\ 6WXG\ 'RFN $UHD)RUPHU /RFNKHHG 0DUWLQ)UHQFK 5RDG)DFLOLW\ 8WLFD -XQH

$5&$',6 D)RUPHU 1RUWKHUQ 3HULPHWHU ,QWHUFHSWRU 'LWFK 2SHUDWLRQ 3DWKZD\ (YDOXDWLRQ 5HSRUW 6ROYHQW 'RFN $UHD -DQXDU\

$5&$',6 E 3UHOLPLQDU\ $FWLYLWLHV)RUPHU 1RUWKHUQ 3HULPHWHU 'LWFK 6ROYHQW 'RFN $UHD)HEUXDU\

$5&$',6 F 'UDIW 6XPPDU\ 5HSRUW RI 6XUIDFH 6RLOV 6DPSOLQJ $FWL /RFNKHHG 0DUWLQ)UHQFK 5RDG)DFLOLW\ 8WLFD 1HZ <RUN

$5&$',6 G $QQXDO *URXQGZDWHU 0RQLWRULQJ 5HSRUW IRU WKH)RUP 0DUWLQ)UHQFK 5RDG)DFLOLW\ 8WLFD 1HZ <RUN

&RUUHFWLYH 0
6WXG\ 5HSRUW
6ROYHQW 'RFN $UH

7DEOHV

7DEOH 0RQLWRULQJ :HOO DQG 3LH]RPHWHU &RQVWUXFWLRQ 'HWDLOV &RUUHFWLYH 0HDVXUHV 5RDG)DFLOLW\ 8WLFD 1HZ <RUN

						)URP 7R 7RS	7R %RWWRP	7RS	%RWWRP				
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		2 %ULHQ
0:		39&									)LOO 7LOO		
0:	6	39&									)LOO		$5&$',6
0:	7	39&									7LOO		$5&$',6
0:	%5	39&									%HGURFN		$5&$',6
0:	6	39&									8QGLIIHUHQWLDWHG 2YHUEXUGHQ		$5&$',6
0:	%5	39&									%HGURFN		$5&$',6
0:	6	39&									8QGLIIHUHQWLDWHG 2YHUEXUGHQ		$5&$',6
0:	%5	39&									%HGURFN		$5&$',6
0:		39&									)LOO 7LOO		$5&$',6
0:		39&									)LOO 7LOO		$5&$',6
0:		39&									)LOO 7LOO		$5&$',6
0:		39&									)LOO 7LOO		$5&$',6
0:		39&									)LOO 7LOO		$5&$',6
0:		39&									)LOO 7LOO		$5&$',6
3=		39&									)LOO 7LOO		
3=		39&									)LOO 7LOO		
3=		39&									7LOO		
3=		39&									7LOO		
3=		39&									7LOO		
3=		39&	@	ÑìÔ	ÑìÔ	ÑìÔ	ÑìÔ	ÑìÔ	7LOO				

7DEOH 0RQLWRULQJ :HOO DQG 3LH]RPHWHU &RQVWUXFWLRQ 'HWDLOV &RUUHFWLYH 0HDVXUHV

5RDG)DFLOLW\ 8WLOLW\ 1HZ<RUN

0RQLWRULQ	'LDPHWHU 0	6FUHH /HQJW	7RS RI 3 5LVHU (OHYDW	:HOO 'HSWI /HQJ4 0R	)URI 7RS	7R %RWV	7RS	%RWWRP	+\GURJHRORJLF 0RQLWRUHG	'DWH ,QV\	&RQVXO 1DPH

7DEOH *URXQGZDWHU (OHYDWLRQ 0HDVXUHPHQWV &RUUHFWLYH 0HDV
)RUPHU /RFNKHHG 0DUWLQ)UHQFK 5RDG)DFLOLW\ 8WLFD 1HZ <RUN

0:

7DEOH $2& 9RODWLOH 2UJDQLF &RPSRXQGV LQ *URXQGZDWHU 6DPSOHV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3HULPHWHU 'LWFK)RUPHU /

7DEOH $2& 9RODWLOH 2UJDQLF &RPSRXQGV LQ *URXQGZDWHU 6DPSOHV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3HULPHWHU 'LWFK)RUPHU /

/RFDWLRQ ,'	
'DWH &ROOHFWHG	8QLW
9RODWLOH 2UJDQLFV	
7HWUDFKORURHWKDQH	XJ /
7ULFKORURHWKDQH	XJ /
7HWUDFKORURHWKDQH	XJ /

7DEOH $2& 9RODWLOH 2UJDQLF &RPSRXQGV LQ *URXQGZDWHU 6DPSOHV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3HULPHWHU 'LWFK)RUPHU /

/RFDWLRQ ,' 'DWH &ROOHFWHG	8QLV
9RODWLOH 2UJDQLFV	
7HWUDFKORURHWKDQH	XJ /
7ULFKORURHWKDQH	XJ /
7HWUDFKORURHWKDQH	XJ /
WULFKORUR WULIOXRURHWKDQH	XJ /
7ULFKORURHWKDQH	XJ /
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'LFKORURHWKHQH	XJ /
'LFKORURSURSHQH	XJ /
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7ULFKOREHQ]HQH	XJ /
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&KORURWROXHQH	XJ /
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&\FORKH[DQH	XJ /
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'LFKORURGLIOXRURPHWKDQH	XJ /
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P S ;\OHQH	XJ /
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0HWK\O WHUW EXW\O HWKHU	XJ /
0HWK\OF\FORKH[DQH	XJ /
0HWK\OHQH &KORULGH	XJ /
P ;\OHQH	XJ /
1DSKWKDOHQH	XJ /
Q %XW\OEHQ]HQH	XJ /
Q 3URS\OEHQ]HQH	XJ /
R ;\OHQH	XJ /
S ,VRSURS\OWROXHQH	XJ /
VHF %XW\OEHQ]HQH	XJ /
6W\UHQH	XJ /
WHUW %XW\OEHQ]HQH	XJ /
7HWUDFKORURHWKHQH	XJ /
7ROXHQH	XJ /
WUDQV 'LFKORURHWKHQH	XJ /
WUDQV 'LFKORURSURSHQH	XJ /
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7ULFKORURIOXRURPHWKDQH	XJ /
9LQ\O $FHWDWH	XJ /
9LQ\O &KORULGH	XJ /
;\OHQHV WRWDO	XJ /

1RWHV
'DWD FRPSDUHG WR 72*6 $PELHQ
16 1R 6WDQGDUG
$OO XQLWV DUH XJ / XQOHVV RWKHU
EJV EHORZ JURXQG VXUIDFH
([FHHGHQFHV QRWHG LQ

/RFDWLRQ ,'	
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,VRSURS\OEHQ]HQH	XJ /
P S ;\OHQH	XJ /
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0HWK\O WHUW EXW\O HWKHU	XJ /
0HWK\OF\FORKH[DQH	XJ /
0HWK\OHQH &KORULGH	XJ /
P ;\OHQH	XJ /
1DSKWKDOHQH	XJ /
Q %XW\OEHQ]HQH	XJ /
Q 3URS\OEHQ]HQH	XJ /
R ;\OHQH	XJ /
S ,VRSURS\OWROXHQH	XJ /
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6W\UHQH	XJ /
WHUW %XW\OEHQ]HQH	XJ /
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7RLXHQH	XJ /
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WUDQV 'LFKORURSURSHQH	XJ /
7ULFKORURHWKHQH	XJ /
7ULFKORURIOXRURPHWKDQH	XJ /
9LQ\O $FHWDWH	XJ /
9LQ\O &KORULGH	XJ /
;\OHQHV WRWDO	XJ /

1RWHV

'DWD FRPSDUHG WR 72*6 $PELHQ

16 1R 6WDQGDUG

$OO XQLWV DUH XJ / XQOHVV RWKHUZ

EJV EHORZ JURXQG VXUIDFH

([FHHGHQFHV EROGHG YDOXHV

7DEOH $2& 9RODWLOH 2UJDQLF &RPSRXQGV LQ *URXQGZDWHU 6DPSOHV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3HULPHWHU 'LWFK)RUPHU /

/RFDWLRQ ,' 'DWH &ROOHFWHG	8QLV
9RODWLOH 2UJDQLFV	
7HWUDFKORURHWKDQH	XJ /
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7ULFKORURHWKDQH	XJ /
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'LFKORURHWKHQH	XJ /
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0HWK\O WHUW EXW\O HWKHU	XJ /
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P ;\OHQH	XJ /
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WHUW %XW\OEHQ]HQH	XJ /
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7RLXHQH	XJ /
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7ULFKORURIOXRURPHWKDQH	XJ /
9LQ\O $FHWDWH	XJ /
9LQ\O &KORULGH	XJ /
;\OHQHV WRWDO	XJ /

1RWHV

'DWD FRPSDUHG WR 72*6 $PELHQ

16 1R 6WDQGDUG

$OO XQLWV DUH XJ / XQOHVV RWKHU

EJV EHORZ JURXQG VXUIDFH

([FHHGHQFHV ERLOHG VXEVWDQGHG

- (VWLPDWHG 9DOXH

7DEOH *URXQGZDWHU 0RGHO &RPSDULVRQV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3H
<RUN

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/RFDWLRQ ,'
'DWH &ROOHFWHG
9RODWLOH 2UJDQLFV J PRO
     WULFKORUR      WULIOXRURPHWKDQH   µPRO /
'LFKORURGLIOXRURPHWKDQH   µPRO /
     7ULFKORURHWKDQH       µPRO /
    'LFKORURHWKDQH         µPRO /
    'LFKORURHWKHQH         µPRO /
    'LFKORURHWKDQH         µPRO /
FLV     'LFKORURHWKHQH     µPRO /
7HWUDFKORURHWKHQH         µPRO /
WUDQV     'LFKORURHWKHQH   µPRO /
7ULFKORURHWKHQH           µ
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7DEOH *URXQGZDWHU 0RODU &RPSDULVRQV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3H
<RUN

/RFDWLRQ ,'
'DWH &ROOHFWHG
9RODWLOH 2UJDQLFV J PRO
W\SH&KORURIRUP FV8UULGLQRRHWKDQH

7DEOH *URXQGZDWHU 0RQLWRULQJ &RPSDULVRQV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3H
<RUN

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/RFDWLRQ ,'
'DWH &ROOHFWHG
9RODWLOH 2UJDQLFV J PRO
     WULFKORUR      WULIOXRURµHWKDQ
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FLV     'LFKORURHWKHQH     µPRO /
7HWUDFKORURHWKHQH         µPRO /
WUDQV     'LFKORURHWKHQH   µPRO /
7ULFKORURHWKHQH           µPRO /
9LQ\O &KORULGH             µPRO /

*URXQGZDWHU (OHYDWLRQ     IW DPV
```

7DEOH $2& ± 9RODWLOH 2UJDQLF &RPSRXQGV 'HWHFWHG LQ 2II 6LWH 6RLO 9DSRU 6DPSOHV &RUUHFWLYH 0HDVXUHV 5RDG)DFLOLW\ 8WLFD 1HZ <RUN

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7DEOH     $2&  ± 9RODWLOH 2UJDQLF &RPSRXQGV 'HWHFWHG LQ 2II 6LWH 6RLO 9DSRU 6DPSOHV  &RUUHFWLYH 0HDVXU
5RDG )DFLOLW\ 8WLFD 1HZ <RUN
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6DPSOH ,'
/DE ,'
6DPSOH 'DWH
6DPSOH 'HSWK
8QLWV—J P
```

7DEOH $2& 9RODWLOH 2UJDQLF &RPSRXQGV 'HWHFWHG LQ 6RLO 6DPSOHV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RU

7DEOH $2& 9RODWLOH 2UJDQLF &RPSRXQGV 'HWHFWHG LQ 6RLO 6DPSOHV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RU

7DEOH $2& 9RODWLOH 2UJDQLF &RPSRXQGV 'HWHFWHG LQ 6RLO 6DPSOHV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RU

7DEOH $2& 9RODWLOH 2UJDQLF &RPSRXQGV 'HWHFWHG LQ 6RLO 6DPSOHV &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RU

7DEOH 3UHOLPLQDU\ (YDOXDWLRQ RI &RUUHFWLYH 0HDVXUH 7HFKQRORJLHV IRU *URXQGZDWHU $2& &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3HULPHWHU 'LWFK

5HVSRQ $FWLRQ	&RUUHFWLYH 0HDVXUH 7HFKQRORJ	3URFHVV 2SWLRQV	'HVFULSWLRQ	5HWDLQ <HV RU	'HFLVLRQ 5DWLRQDOH
([6LWX 7UHDWP	3K\VLFD	$LU 6WULSSLQ	&RQWDPLQDQWV DUH WUDQVIHUUHG IURP SKDVH 2II JDV PD\ UHTXLUH DGGLWLRQ	<HV	&RQYHQWLRQDO WHFKQRORJ\ IRU H[V 92&V &XUUHQWO\ XVHG DW WKH VLW
	&DUERQ $GVRUSWLRQ	&RQWDPLQDQWV DUH UHPRYHG IURP WKH RQWR DFWLYDWHG FDUERQ	<HV	&RQYHQWLRQDO WHFKQRORJ\ IRU H[V 92&V	
	&KHPLFD	89 &KHPLFDO 2[LGDWLRQ	2[LGDQWV GHVWUR\LQJ 92&V E\ FKDQJLQ FRQWDPLQDQWV XVLQJ 89 UDGLDWLRQ DQ	<HV	([VLWX WUHDWPHQW RI JURXQGZDWH KDYH EHHQ DSSOLHG DW D YDULHW\ R FROOHFWLRQ DQG GLVFKDUJH
		2]RQH	8VH RI R]RQH WR R[LGL]H FRQWDPLQDQWV H[VLWX	<HV	XPSOHPHQWDEOH WHFKQRORJ\ IRU 92&
		2[LGDWLRQ	8VH RI VWURQJ R[LGL]LQJ DJHQW WR R[LGL]H FRQWDPLQDQWV H[VLWX	<HV	WDSOLFDWLQJ WHFKQRORJ\ IRU 92&
	%LRORJL	$HURELF %LRUHDFWRU	$HURELF ELRGHJUDGDWLRQ SHUIRUPHG L FRQWDPLQDQW UHPRYDO IURP D SURFHV	1R	,QHIIHFWLYH WHFKQRORJ\ IRU &92&V
		$QDHURELF %LRUHDFWRU	%LRGHJUDGDWLRQ LQ WKH DEVHQFH RI R ELRUHDFWRU IRU FRQWDPLQDQW UHPRYD	1R	/RQJ K\GUDXOLF UHWHQWLRQ WLPHV I FKORULQDWHG HWKHQHV UHTXLUH OD
		3K\WRUHPHGLDW &RQVWUXFWL	3URYLGHV ELRORJLFDO WUHDWPHQW IRU VXVSHQGHG DQG GLVVROYHG RUJDQLF	1R	7HFKQRORJ\ LPSOHPHQWDEOH DW WKH V
'LVSRVI 'LVFKDU	'LVFKDU	327:	2II VLWH GLVFKDUJH WR D 327: XQGHU DSSOLFDEOH	<HV	327:V W\SLFDOO\ DFFHSW UHPHGLDWL HIIOXHQWV WKURXJKRXW WKH SHUPLW RQ VLWH SUHWUHDWPHQW IRU 92&V
		)DFLOLW\ 8VH	1R SRWDEOH RQ VLWH UHXVH RI WUHDWHG JURXQGZDWHU	<HV	1R SRWDEOH ZDWHU FRXOG SRVVLEO RZQHU
		5HLQMHFWLRQ	5HLQMHFW WUHDWHG JURXQGZDWHU PHH RXWVLGH WKH DUHDV RI FRQWDPLQDWLR	1R	,QHIIHFWLYH LQ ORZHU SHUPHDEOH V
		6XUIDFH :DWHU	6XUIDFH WUHDWHG JURXQGZDWHU PHHWLQJ 6'(	<HV	2Q VLWH GLVFKDUJH RI WUHDWHG JUR 6 SHUPLW UHTXLUHPHQWV LQ FRQMXQ WUHDWPHQW DQG LV WKH FXUUHQW S
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1RWHV
01$ 0RQLWRUHG 1DWXUDO $WWHQXDWLRQ
'3('XDO 3KDVH ([WUDFWLRQ
92&V 9RODWLOH 2UJDQLF &RPSRXQGV
&92&V &KORULQDWHG 9RODWLOH 2UJDQLF &RPSRXQGV
89 8OWUDYLROHW
*$& *UDQXODWHG $FWLYDWHG &DUERQ
327: 3XEOLF 2ZQHG 7UHDWPHQW :RUNV
63'(6 6WDWH 3ROOXWDQW 'LVFKDUJH (OLPLQDWLRQ 6\VWHP
7HFKQRORJ\ QRW UHDGLQHG ZDV VKDGHG

7DEOH 3UHOLPLQDU\ (YDOXDWLRQ RI &RUUHFWLYH 0HDVXUH 7HFKQRORJLHV IRU 6RLO $2& &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3HULPHWHU 'LFK)R

7DEOH (YDOXDWLRQ RI $OWHUQDWLYHV IRU $UHDV DQG &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHUQ 3HULPHWHU 'LV

RDOV	3URWHFW\ ++ (	6RXUF &RQWI	$WWDLQI &ULWH		'RHV DOWHU ZDUUDQW IX FRQVLGHUD
$OWHUQDWLYH $F WLRQ	1R	1R	1R	1R	<HV
$OWHUQDWLYH $&RQWLQXHG 2SHUDWLRQ RI WKH *&76 ,QVWHXWLRQDO &RQWUROV	<HV	<HV	<HV	<HV	<HV
$OWHUQDWLYH ([WHQVLRQ RI WKH *URXQGZDWHU 5HFRYHU &RQWLQXHG 2SHUDWLRQ RI WKH *&76 ,QV	<HV	<HV	<HV	<HV	<HV
$UHD					
$OWHUQDWLYH $F WLRQ	1R	1R	1R	1R	<HV
$OWHUQDWLYH $&RQWLQXHG 2SHUDWLRQ RI WKH *&76 ,QVWHXWLRQDO &RQWUROV	<HV	<HV	<HV	<HV	<HV
$OWHUQDWLYH)RFXVHG ([FDYDWLRQ 01$ &RQWLQXHG 2S ,QVWLWXWLRQDO &RQWUROV	<HV	<HV	<HV	<HV	<HV
$OWHUQDWLYH &RPSOHWH ([FDYDWLRQ 01$ &RQWLQXHG ,QVWLWXWLRQDO &RQWUROV	<HV	<HV	<HV	<HV	<HV

1RWHV
01$ 0RQLWRUHG 1DWXUDO $WWHQXDWLRQ
*&76 *URXQGZDWHU &ROOHFWLRQ DQG 7UHDWPHQW 6\VWHP
++ (+XPDQ +HDOWK DQG (QYLURQPHQW
$UHDV DUH GHILQHG RQ)LJXUH

7DEOH 6XPPDU\ RI 6XVWDLQDELOLW\ (YDOXDWLRQ RI $OWHUQDWLYHV IRU $UHDV DQG &RUUHFWLYH 0HDVXUHV 6WXG\ )RUP <RUN

$OWHUQD	$OWHUQDWLYH 'HVFULSWLRQ	(QHUJ\	&DUERQ)RRWSU $LU (PLVVLRQV
		8VDJH 8QLWV	8QLW 8VDJH $VV 8QL
$UHD			
$OWHUQDWLYH $	1R $FWLRQ	N:K	0HWULF 7RQ
$OWHUQDWLYH %	0LQ$ &RQWLQXHG 2SHUDWLRQ RI WKH *&76 ,QVWLWXWLRQDO &RQWUROV	N:K	0HWULF 7RQ
$OWHUQDWLYH &	([WHQVLRQ RI WKH *URXQGZDWHU 5HFRYHU\ 7U 2SHUDWLRQ RI WKH *&76 ,QVWLWXWLRQDO &R	N:K	0HWULF 7RQ
$UHD			
$OWHUQDWLYH $	1R $FWLRQ	N:K	0HWULF 7RQ
$OWHUQDWLYH %	0LQ$ &RQWLQXHG 2SHUDWLRQ RI WKH *&76 ,QVWLWXWLRQDO &RQWUROV	N:K	0HWULF 7RQ
$OWHUQDWLYH &	)RFXVHG ([FDYDWLRQ 01$ &RQWLQXHG 2SHUD &RQWUROV	N:K	0HWULF 7RQ
$OWHUQDWLYH '	([FDYDWLRQ 01$ &RQWLQXHG 2SHUDWLRQ RI WKH *&76 ,QVWLWXWLRQDO &RQWUROV	N:K	0HWULF 7RQ

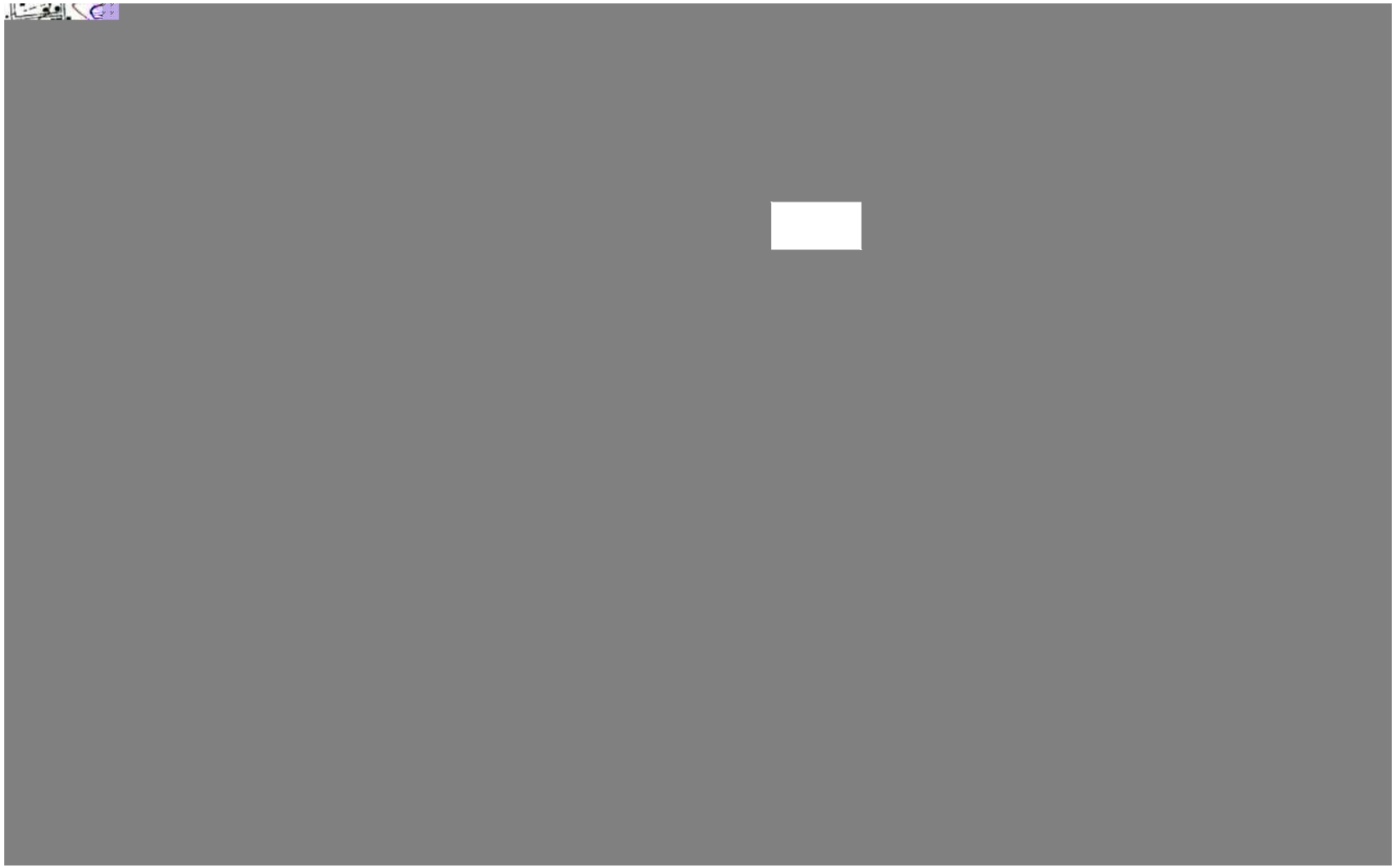
8VDJH IRU HQHUJ\ DQG PDWHULDO DQG ZDVWH DUH URXQGHG WR WKH QHDUHVW

7 D E O H 6 X P P D U \ R I 6 X V W D L Q D E L O L W \ (Y D OBÐS L p @ ð € 0 R I%• V P D OBÐS L `… R IÀ I%•@D OFp • O H OAD OV p •&W

7DEOH 4XDQWLWDWLYH (YDOXDWLRQ RI $OWHUQDWLYHV IRU $UHDV DQG &RUUHFWLYH 0HDVXUHV 6WXG\ )RUPHU 1RUWKHU

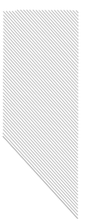
/RQJ 7HUP (IIHFWLYH 5HGXFWLRQ 709 RI :DV'	6KRUW 7 (IIHFWLYH ,PSOHPHQWDELOLW\	6XVWDLQDELOLW\ &RVW

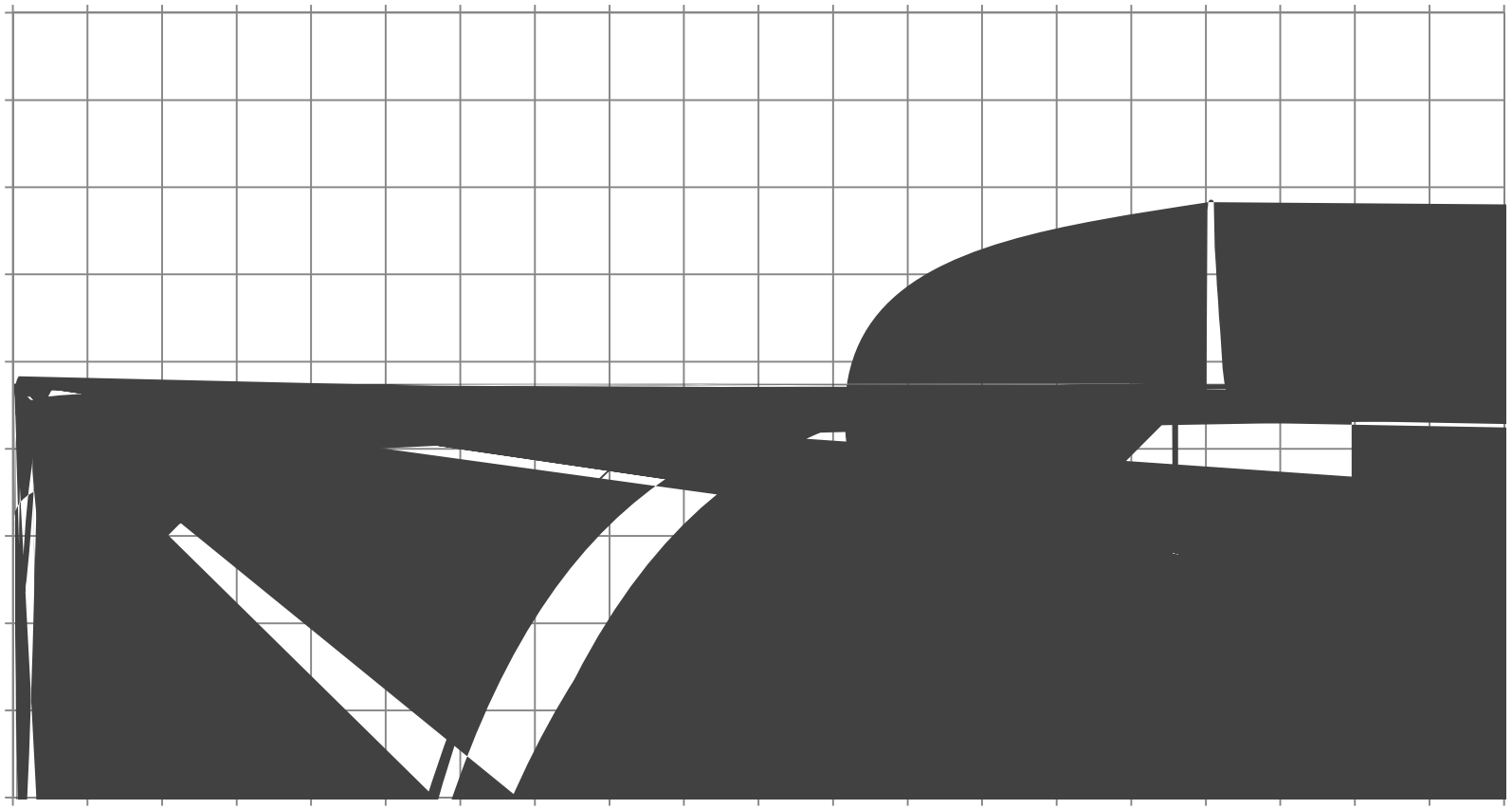
)LJXUHV



0 120
SCALE IN FEET

SITE LOCATION MAP





&OLHQW /RFNKHHG 0DUWLQ &RUSRUDWLRQ

:HOO %RUHKROH 'HVLJQDWLRQ :HOO %' $3=

6LWH /RFDWLRQ

%RUHKROH 'HSWKV

8WLFD 1HZ <RUN

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW\SH	5HFRYHU\ ,QFW	3,' +HDGVSDFH	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWURO	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RUHKROH &RQVWUXFWLRQ
							7,//	
							'DUN JUD\ 6$1'< 6,/7 DQG YHU\ ILQH WR ILQH 6$1' VRPH ILQH WR PHGLXP VXEURXQGHG WR VXEDQJXODU *UDYHO PHGLXP VWLII PHGLXP GHQVH QR SODVWLFLW\ 7,//	
485								
20								
							'DUN JUD\ 6$1'< 6,/7 DQG YHU\ ILQH WR ILQH 6$1' VRPH ILQH WR PHGLXP VXEURXQGHG WR VXEDQJXODU *UDYHO PHGLXP VWLII PHGLXP GHQVH QR SODVWLFLW\ 7,//	
480								
25							'DUN JUD\ 6$1'< 6,/7 DQG YHU\ ILQH WR ILQH 6$1' VRPH ILQH WR PHGLXP VXEURXQGHG WR VXEDQJXODU *UDYHO PHGLXP VWLII PHGLXP GHQVH QR SODVWLFLW\	
475								
30								
470								
35								

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5HPDUNV

DJV DERYH JURXQG VXUIDFH EJV EHORZ JURXQG VXUI
$SSOLFDEOH $YDLODEOH $06/ $ERYH 0HDQ 6HD /HYHO

/RFDWLRQ KDQG FOHDUHG DLU NQLIHG EJV $QDO\WL
92&V

3URM1-FW 7HPSODWH?RFNZDUH?/RJ3ORW ?/RJ)LOHV?7HPSODWHV?2ERO0DQ3DZHOO3 3URSUE
'DWD)LOH% 3= GDW 'DWH &UHDWHG (Q\WHG E\

'DWH 6WDUW)LQLVK

(DVWLQJ
&DVLQJ (OHYDWLRQ

6XUIDFH hQ(ÁP9 YDPWL RùP @ @RULQJ (1'ÐVW P9À ,rÒ wÐV ð9b Q ' hA 8dWvŒ'

'HVFULSWLRQV %\

M €6 0 6 7À qrÐ • % Ð6 6@ @ 8dfbL–€ hA@ 8dWvŒ! h@ P †EwhÂ #"Ð @ †EwhÉh "Ð @ P †

·HOO %RULQJ

6WUDWLJUDSKLF 'HVFULSWLRQ &RQVWUXFWLRQ

~

&OLHQW &KHHNKHHG 0DUWLQ &RUSRUDWLRQ

:HOO %RUH $QJOH '

%RUHKROH 'HSWK

6LWH /RFDWLRQ

8WLFD 1HZ <RUN

5HFRYHU\ 3LSHOLQH 6DPSOH

'(37+ (/(9$7,21

6DPSOH 5XQ 1XPEHU

6DPSOH ,QWHUYDO

5HFRYHU\ ,QWHUYDO

3,' +HDGVSDFH

$QDO\WLFDO 6DPSOH

*HRORJLF &ROXPQ

6WUDWLJUDSKLF 'HVFULSWLRQ

:HOO %RULQJ &RQVWUXFWLRQ

485

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480

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475

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470

35

'DUN EURZQ JUD\ 6$1'< ,/7 DQG YHU\ ILQH WR ILQH 6$1' IHZ FRDUVH 6DQG WR ILQH VXEURXQGHG WR VXEDQJXODU *UDYHO WUDFH &OD\ WUDFH FRDUVH 3HEEOH ORZ SODVWLFLW\ DW &OD\ LQWHUYDO EJV QR SODVWLFLW\ WHW 7,//

5HPDUNV DERYH JURXQG VXUIDFH EJV EHORZ JURXQG VXUI $SSOLFDEOH $YDLODEOH $06/ $ERYH 0HDQ 6HD /HYHO

/RFDWLRQ KDQG FOHDUHG DLU NQLIHG EJV $QDO\WL 92&V

5HIXVDO DW EJV (

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3URMHFW 7HPSODWH?ZRFNZDUH?/RJ3ORW ?/RJ)LOHV?7HPSODWHV?EORQGBZHOO3URSURE

'DWD)LOH GDW 'DWH &UHDWHG (-/WHG E\

&OLHQW

:HOO %RULQJ ,'

6LWH /RFDWLRQ

%RUHKROH 'HSWK

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHHW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RORXU	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ

20 490

25 485

30 480

35 475

5HPDUNV

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'DWH 6WDUW)LQLVK 'ULOOLQJ &RPSDQ\ 'ULOOHU V 1DPH 'ULOOLQJ 0HWKRG 6DPSOLQJ 0HWKRG 5LJ 7\SH	1RUWKLQJ (DVWLQJ &DVLQJ (OHYDWLRQ %RUHKROH 'HSWK 6XUIDFH (OHYDWLRQ 'HVFULSWLRQV %\	:HOO %RULQJ ,' &OLHQW /RFDWLRQ

'(37+ (//(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHHW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWH[W	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ

	5HPDUNV

&OLHQW

:HOO %RULQJ ,'

6LWH /RFDWLRQ

%RUHKROH 'HSWK

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHHW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWURO	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ

490

485

480

475

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5HPDUNV

3URMHFW 'DWD)LOH

7HPSODWH

'DWH &UHDWHG (GLWHG E\

'DWH 6WDUW)LQLVK
'ULOOLQJ &RPSDQ\ (QYLURQPHQWDO 6HUYLFHV
'ULOOHU V1DPH2UVL
'ULOOLQJ 0HWKRG 3XVK
6DPSOLQJ 0HWKRG $FHWDWH /LQHU
5LJ 7\SH7UDFN 0RXQWHG *HRSUREH 6\VWHP

1RUWK1$'
(DVWLQJ
&DVLQJ (OHY1DWXP

'HVFULSWLRQ

:HOO %RULQJ'
&OLHQWNKHG 0DUWLQ &RUSRUDWL
/RFDWLRQ)UHQFK 5RDG
8WLFD 1HZ <RUN

'(37+ ((/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHHW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWURO	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ
0							'DUN EURZQ UHG *5$9(/< 6,/7),//	
			1$					
5							6ORXJK GDUN EURZQ *5$9(/< 6,/7 7,//	
							5HG EURZQ *5$9(/< 6,/7 DQG ILQH WR PHGLXP VXEURXQGHG PHGLR'e p€p0PHGLR'e p	
10								
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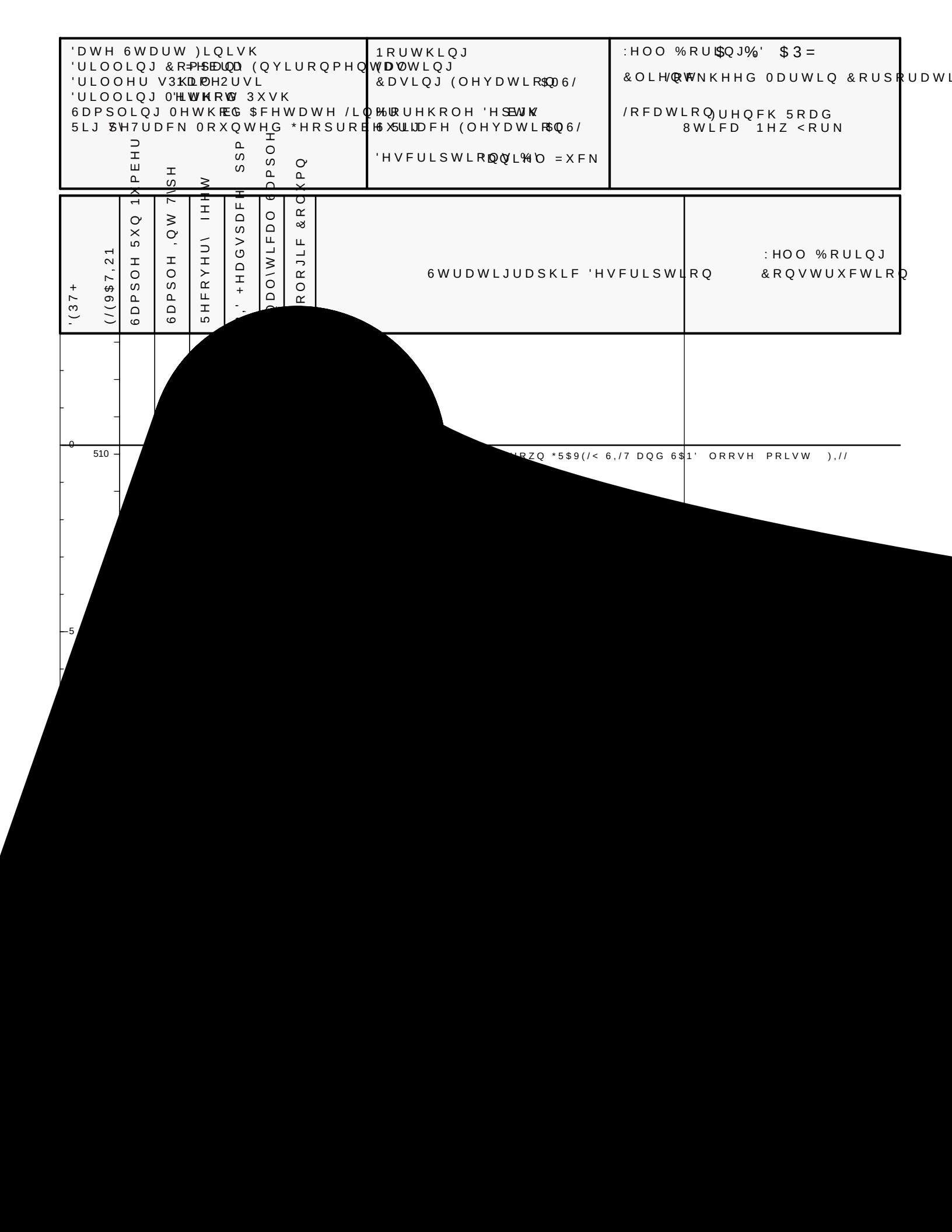
5HPDUNV

DJV DERYH JURXQG VXUIDFH EJV EHORZ JURXQG VXUI
$SSOLFDEOH $YDLODEOH $06/ $ERYH 0HDQ 6HD /HYHO

/RFDWLRQ KDQG FOHDUHG DLU NQLIHG EJV $QDO\WL
92&V '83 FROOHFWHG

3URM1-FW 7HPSO'DWH5HFRUG?/RJ3ORW ?/RJ)LOHV?7HPSODWHV?EORQGHZHOO3HRSURE
'DWD $LH GDW 'DWH &UHDWHG (G-WHG E\


'DWH 6WDUW)LQLVK
'ULOOLQJ &RPSDQ
'ULOOHU V3KRQH
'ULOOLQJ 0HWKRG
6DPSOLQJ 0HWKRG
5LJ 7\SH
1RUWKLQJ
&DVLQJ (OHYDWLRQ
:HOO %RUH
&OLHQW
/RFDWLRQ
8WLFD 1HZ <RUN
'(37+
6DPSOH 5XQ 1R
6DPSOH ,QW 7\SH
5HFRYHU\ ,QGH
6WUDWLJUDSKLF 'HVFULSWLRQ
:HOO %RULQJ &RQVWUXFWLRQ
0
510
5

'DWH 6WDUW)LQLVK 'ULOOLQJ &RPSDQ\ (QYLURQPHQWDO 'ULOOHU V3LQDPH2UVL 'ULOOLQJ 0HWKRG 3XVK 6DPSOLQJ 0HWKRG $FHWDWH /LQHU 5LJ 7\SH 0RXQWHG *HRSUREH 6XUIDFH (OHYDWLRQ	1RUWKLQJ (DVWLQJ &DVLQJ (OHYDWLRQ 'HVFULSWLRQ RI %RUHKROH	:HOO %RULQJ &OLHQW /RFDWLRQ

'(37+ ((/(9$7,21	6DPSOH 5XQ 1R PEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHHW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWH[W	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ
0 510								
			1$					
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10 500								
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5HPDUNV

DJV DERYH JURXQG VXUIDFH EJV EHORZ JURXQG VXUI
$SSOLFDEOH $YDLODEOH $06/ $ERYH 0HDQ 6HD /HYHO

/RFDWLRQ KDQG FOHDUHG DLU NQLIHG EJV $QDO\WL
92&V

3URM1-FW 7HPSO*D3HR RFNZDUH?/RJ3ORW ?/RJ)LOHV?7HPSODWHV?2EROQ3BZHOO3HRSURE
'DWD $LL%HB$ 3= GDW 'DWH &UHDWHG (1-%WHG E\

tE DHO U HG 6 PO Dd HG FR Y! P S`p#F R °

&OLHQW

:HOO %RUH$QJ%' $3=

6LWH /RFDWLRQ

%RUHKROH 'HSWK

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHHW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWURO	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RUHKROH &RQVWUXFWLRQ
20 490								
25 485								
30 480								
35 475								

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5HPDUNV

&OLHQW	:HOO %RULQJ ,'
6LWH /RFDWLRQ	%RUHKROH 'HSWK

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHFW SSP	3,' +HDGVSDFH 6DPSOH	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWXPQ	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ

	5HPDUNV

&OLHQW: Knheh Martin Corporation

6LWH /RFDWLRQ: Richard Road
8WLOLW\ 1DPH: New York

:HOO %RUHKROH 'HVLJQ

%RUHKROH 'HSWK

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW\SH	5HFRYHU\ ,QGH[	3,' +HDGVSDFH	$QDO\WLFDO 6DPSOH	*HRORJLF &RORXPQ	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ
490							'DUN JUD\ 6$1'< 6,/7 DQG ILQH WR PHGLXP VXEDQJXODU 6$1' IHZ PHGLXP WR FRDUVH VXEURXQGHG WR VXEDQJXODU /LPHVWRQH *UDYHO PHGLXP GHQVH ZHW 7,//	
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5HPDUNV: DJV DERYH JURXQG VXUIDFH EJV EHORZ JURXQG VXUI
$SSOLFDEOH $YDLODEOH $06/ $ERYH 0HDQ 6HD /HYHO

/RFDWLRQ KDQG FOHDUHG DLU NQLIHG EJV $QDO\W
92&V

3URM1-FW 7HPSO'DWH?RFNZDUH?/RJ3ORW ?/RJ)LOHV?7HPSODWHV?EROLQJBZHOO3URSURE
'DWD 3L=OH GDW 'DWH &UHDWHG (1-WHG E\

'DWH 6WDUW)LQLVK 'ULOOLQJ &RPSDQ\ 'ULOOHU V 1DPH 'ULOOLQJ 0HWKRG 6DPSOLQJ 0HWKRG 5LJ 5HOHDVH	1RUWKLQJ (DVWLQJ &DVLQJ (OHYDWLRQ %RUHKROH 'HSWK 6XUIDFH (OHYDWLRQ 'HVFULSWLRQV %\	:HOO %RULQJ ,' &OLHQW /RFDWLRQ

6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH		3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH 0		6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ

'DWH 6WDUW)LQLVK
'ULOOLQJ &RPSDQ\ (QYLURQPHQWDO
'ULOOHU V-RE&RQ&HZO
'ULOOLQJ 0HWKRG 3XVK
6DPSOLQJ 0HWKRG $FWDWH /LQHU
5LJ 7\SH7UDFN 0RXQWHG *HRSUREH 6\VWHP

1RUWKLQJ (DVWLQJ
&DVLQJ (OHYDWLRQ 06/
'HVFULSWLRQ RI 0DWHULDO

:HOO %RULQJ ,'
&OLHQW&RQWUDFWRU 0DUWLQ &RUSRUDWL
/RFDWLRQ)UHQFK 5RDG
8WLFD 1HZ <RUN

'(37+ ((/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHHW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWURO	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ
							EJV	

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FRYHU
0HGLXP EURU v'8Y"Wv,7–Ž eá †WxÂH epLÁ "… Œa 9 f' ÅP#`I @EURU$gb&Ewh b •0PP R"•B&Ewh d5 0PP RP

1$

5HPDUNV DERYH JURXQG VXUIDFH EJV EHORZ JURXQG VXUI
$SSOLFDEOH $YDLODEOH $06/ $ERYH 0HDQ 6HD /HYHO

/RFDWLRQ KDQG FOHDUHG DLU NQLIHG EJV $QDO\WL
92&V

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&OLHQW

:HOO %RULQJ ,'

6LWH /RFDWLRQ

%RUHKROH 'HSWK

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW\SH	5HFRYHU\ IHHW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RORXU	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ
	20							
485	25							
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480	30							
25								
475								
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470								
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5HPDUNV

3URMHFW 'DWD)LOH

7HPSODWH

'DWH

&UHDWHG (GLWHG E\

'DWH 6WDUW)LQLVK
'ULOOLQJ &RPSDQ\ (QYLURQPHQWDO
'ULOOHU V-RE&RQ&HZO
'ULOOLQJ 0HWKRG 3XVK
6DPSOLQJ 0HWKRG $FWDWH /LQHU
5LJ 7\SH 0RXQWHG *HRSUREH 6XUIDFH (OHYDWLRQ

1RUWKLQJ
($67,1*
&DVLQJ (OHYDWLRQ 06/

'HVFULSWLRQ

:HOO %RUHKROH 'HVLJQ
&OLHQW &RQVWUXFWHG 0DUWLQ &RUSRUDWL
/RFDWLRQ)UHQFK 5RDG
8WLFD 1HZ <RUN

'(37+ ((/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ ,QFKHV	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWDFW	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ

0 505
5 500
10 495
15 490

5HPDUNV

DJV DERYH JURXQG VXUIDFH EJV EHORZ JURXQG VXUI
$SSOLFDEOH $YDLODEOH $06/ $ERYH 0HDQ 6HD /HYHO

/RFDWLRQ KDQG FOHDUHG DLU NQLIHG EJV $QDO\WL
IRU 92&V IFD ` p @00ðÀ`@Pð€O'GDV OLFD)"\ 0ðÀ`@Pð€O'G

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&OLHQW: Rowkhhg 0duwlq &rusrudwlrq

:hoo %rulqj ,'

%rukroh 'hswk

6lwh /rfdwlrq

8wlfd 1hz <run

'(37+ (/(9$7,21	6dpsoh 5xq 1xpehu	6dpsoh ,qwhuydo 7\shv	5hfryhu\ ihhw	3,' +hdgvspdfh sqg	$qdo\wlfdo 6dpsoh	*hrorjlf &rpsrxqg	6wudwljudskli 'hvfulswlrq	:hoo %rulqj &rqvwuxfwlrq
							'dun jud\ 6$1'< 6,/7 dqg ilqh wr phdlxp vxedqjxodu 6$1' ihz phdlxp wr frduvh vxedqjxodu *udyho yhu\ ghqvh qr sodvwlflw\ zhw@ 3axo"qr	

20 485

25 480

30 475

35 470

5hpdunv

Dqv deryh jurxqg vxuidfh ejv ehorz jurxqg vxui
$ssolfdeoh $ydlodeoh $06/ $eryh 0hdq 6hd /hyho

/rfdwlrq kdqg fohduhg dlu nqlihg ejv $qdo\wl
ejv iru 92&v

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3urm1-Fw 7hpsodwh?rfnzduh?/rj3orw ?/rj)lohv?7hpsodwhW2eroqg3dzhoo3hrsure
'dwd)L=OH GDW 'dwe &uhdwhg (G\WHG E\

'DWH 6WDUW)LQLVK 'ULOOLQJ &RPSDQ\ 'ULOOHU V 1DPH 'ULOOLQJ 0HWKRG 6DPSOLQJ 0HWKRG 5LJ 7\SH	1RUWKLQJ (DVWLQJ &DVLQJ (OHYDWLRQ %RUHKROH 'HSWK 6XUIDFH (OHYDWLRQ 'HVFULSWLRQV %\	:HOO %RULQJ ,' &OLHQW /RFDWLRQ

	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH		3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPOH (*'HHIR'RJJHSAW	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ	

	:HOO %RULQJ

&OLHQW &OLHQW 0DUWLQ &RUSRUDWLRQ

6LWH /RFDWLRQ
8WLFD 1HZ <RUN

:HOO %RUHKROH 1R 3=-
%RUHKROH 'HSWK

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW\SH	5HFRYHU\ ,QFK	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RORXU	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RUHKROH &RQVWUXFWLRQ
485							VXEURXQGHG WR VXEDQJXODU *UDYHO YHU\ VWLII WR YHU\ GHQVH QR SODVWLFLW\ PL 7,//	
20							0HGLXP WR GDUN JUD\ *5$9(/< 6,/7 DQG ILQH WR PHGLXP VXEURXQGHG WR VXEDQJXODU *5$9(/ IHZ PHGLXP WR FRDUVH VXEURXQGHG 6DQG WUDFH FRDUVH VXEURXQGHG WR VXEDQJXODU *UDYHO YHU\ VWLII WR YHU\ GHQVH QR SODVWLFLW\ PL 7,//	
							'DUN JUD\ YDUYHG &/$< WUDFH YHU\ ILQH WR ILQH 6DQG PHGLXP VWLII ORZ SODVWLFLW\ PRLVW &/$<	
480								
25								
475								
30								
470								
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5HPDUNV

DJV DERYH JURXQG VXUIDFH EJV EHORZ JURXQG VXUI
$SSOLFDEOH $YDLODEOH $06/ $ERYH 0HDQ 6HD /HYHO

/RFDWLRQ KDQG FOHDUHG DLU NQLIHG EJV $QDO\WL
IRU 92&V 06 06' FROOHFWHG

3URM1-FW 7HPSODWH?RFNZDUH?/RJ3ORW ?/RJ)LOHV?7HPSODWHV?EORQGBZHOO3URSUE
'DWD)LOH GDW 'DWH &UHDWHG (LWWHG E\

&OLHQW	:HOO %RULQJ ,'
6LWH /RFDWLRQ	%RUHKROH 'HSWK

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHFW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RUXPQ	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ

' D W H 6 W D U @ 1b' D @ D @ WK1m

' D W H 6 W D U W Ô@Åp @Åp t°Ð

&OLHQW

:HOO %RULQJ ,'

6LWH /RFDWLRQ

%RUHKROH 'HSWK

'(37+ (/(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHHW	3,' +HDGVSDFH SSP	$QDO\WLFDO 6DPSOH	*HRORJLF &RQWXPQ	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ

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5HPDUNV

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'DWH 6WDUW)LQLVK 'ULOOLQJ &RQWUDFWRU :ROII 'ULOOHU V%LOO 5LFH 'ULOOLQJ 0HWKRG $XJHU 6L]H 5LJ 7\SH 6DPSOLQJ 0HWKRG	1RUWKLQJ (DVWLQJ &DVLQJ (OHYDWLRQ %RUHKROH 'HSWK 6XUIDFH (OHYDWLRQ 'HVFULSWLRQV %\	:HOO %RULQJ ,' &OLHQW /RFDWLRQ

'(37+ (//(9$7,21	6DPSOH 5XQ 1XPEHU	6DPSOH ,QW 7\SH	5HFRYHU\ IHHW	%ORZ &RXQWV	1 9DOXH	3,' +HDGVSDFH SSP	*HRORJLF &RQWDPLQDQW	6WUDWLJUDSKLF 'HVFULSWLRQ	:HOO %RULQJ &RQVWUXFWLRQ

0 505

5 500

10 495

15 490

	5HPDUNV

3URMHFW 1XPEHU 7HPSODWH 3DJH RI
'DWD)LOH 'DWH

' D W H 6 W D U@ Á)LQ)L


```
'DWH 6W
'ULOOL
'ULOOH
'ULOOL
$XJHU 6
5LJ 7\SH
6DPSOL
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'(37+
(/(9$7,21
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'LVSODFHPHQW IW
7LPH PLQ

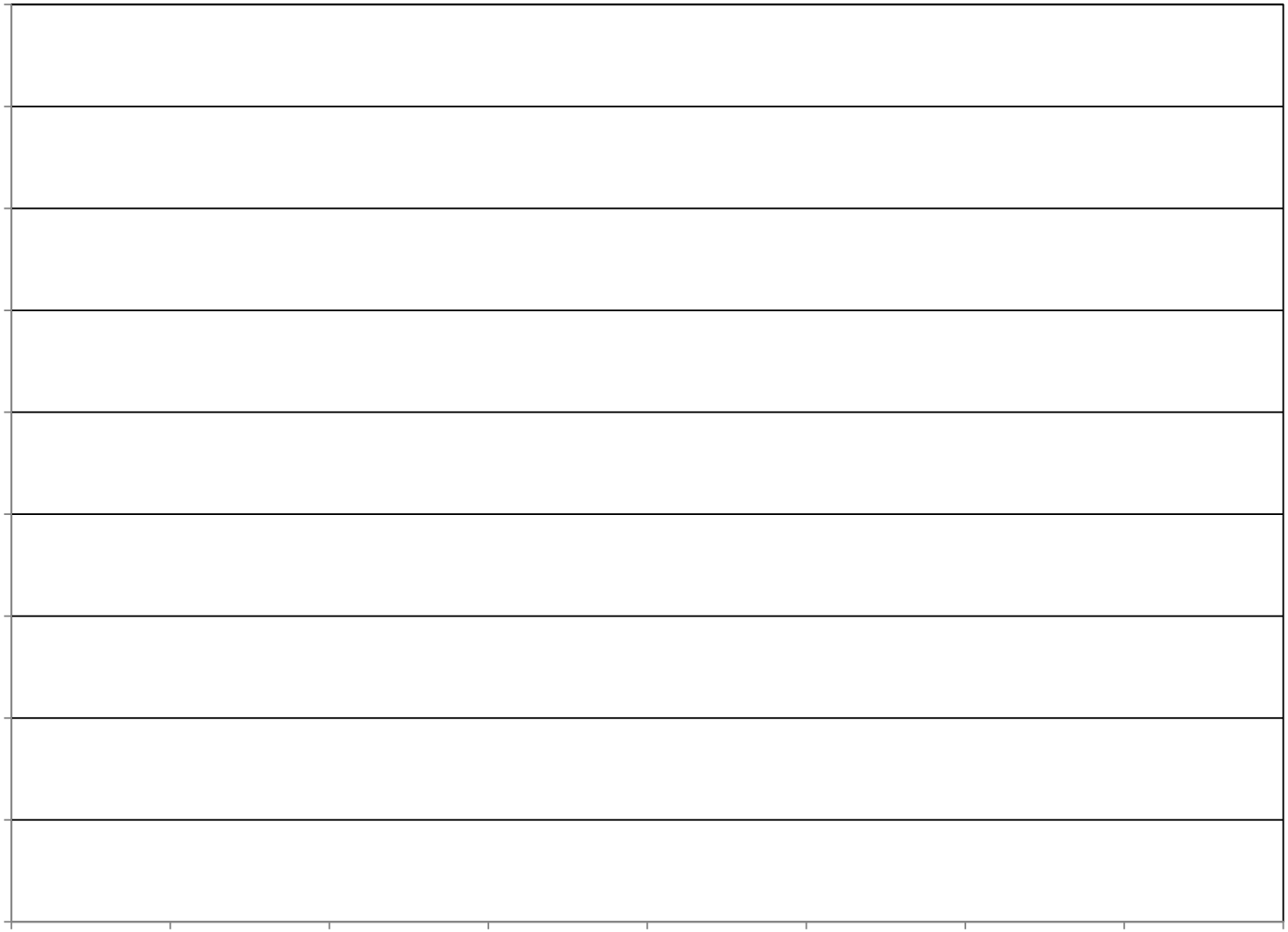
'LVSODFHPHQW IW
7LPH PLQ

TABLE C-3
SUMMARY OF IRZ PILOT TEST GROUNDWATER ANALYTICAL RESULTS

TABLE C-3
SUMMARY OF IRZ PILOT TEST GROUNDWATER ANALYTICAL RESULTS
Former Lockheed Martin French Road Facility
Utica, New York

Analytes	Analysis Method	Sample ID: / Date Sampled:	11/30/2011	4/3/2012	4/4/2012	4/5/2012	4/6/2012	4/9/2012	4/11/2012	4/13/2012	4/24/2012	5/9/2012	6/5/2012	7/12/2012
		NYSDEC TOGS (µg/L)												
Volatile Organic Carbons (µg/L)														
Tetrachloroethylene	USEPA 8260B	5	0.36 U	1.8 U	NM	3.6 U	7.2 U	7.2 U	NM	`	7.2 U	7.2 U	14 U	1.8 U
Trichloroethylene		5	190 D [170 D]	130	NM	130	180	110	NM	170	170	480	18 U	2.6 J
cis-1,2-Dichloroethylene		5	1,900 D [1,800 D]	1900 D	NM	1400 D	1400	1400	NM	920 J	1400 J	2500 D	4000	890 D
trans-1,2-Dichloroethylene		5	18 [18]	15	NM	12	18 U	18 U	NM	18 U	18 J	38	38 J	22
Vinyl chloride		2	170 D [160 D]	150	NM	99	99	120	NM	36	63	150	350	660
1,2-Dichlorobenzene		3	7.9 U	4.0 U	NM	7.9 U	16 U	16 U	NM	16 U	16 U	16 U	32 U	4.0 U
1,1-Dichloroethane		5	5.1 [5.1]	3.0 J	NM	3.8 U	7.6 U	7.6 U	NM	7.6 U	7.6 U	10 J	15 U	7.9
Methyl tert-butyl ether		NS	0.16 U	0.80 U	NM	1.6 U	3.2 U	3.2 U	NM	3.2 U	3.2 U	16 U	6.4 U	0.80 U
2-Butanone (MEK)		50	1.3 U	6.6 U	NM	13	26 U	26 U	NM	26 U	96 J	7.6 U	370 J	320
Groundwater Quality														
Nitrate as N (mg/L)	353.2	10	0.011 HU	0.011 HU	NM	0.043 J H	0.011 U	0.031 J H	NM	0.042 J	0.011 U	0.011 U	0.011 U	0.011 U
Sulfate (mg/L)	D516-90,03	250	5.3 B	5.3 B	NM	6	372	361 B	NM	497	69.4 B	186	11	5.8
Total Organic Carbon (mg/L)	SM 5310D	NS	2.4	2.4	NM	870	2800	23.5	NM	3780	2900	2170	1770	1170
Metals														
Arsenic, total (mg/L)	USEPA 6010B	0.01	0.0057 J	0.0057 J	NM	0.037	0.029	0.033	0.023	0.025	0.016	0.0089 J	0.0056 U	0.0059 J
Arsenic, dissolved (mg/L)		0.01	0.0056 U	0.0056 U	NM	0.0056 U	0.019	0.018 J	0.0098 J	0.0094 J	0.0089 J	0.0056 U	0.0073 J	0.0056 U
Dissolved Gases														
Methane (µg/L)	RSK-175	NS	4400	4400	NM	2900	2100	2300	NM	120	440 B	1200 B	6400 B	1900
Tracer Dyes (Ozark Underground Lab)														
Fluorescein (ppb)		NS	ND	ND	4100	NM	17800	NM	NM	14900	6530	1800	523	836

Footnotes:
USEPA - United States Environmental Protection Agency
Concentrations in bold indicate detections
Concentrations in bold and shaded exceed NYSDEC SGVs
NYSDEC TOGS -New York State Department of Environmental Conservation Technical and Operational Guidance Series
B - Indicates an estimated value between the instrument detection limit and the Reporting Limit (RL).
NS - No standard



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*UHHQ DQG 6XVWDL
5HPHGLDWLRQ $QDC

Appendix E. Sustainability

Quantitative sustainability was assessed to differentiate evaluations of the proposed corrective measure alternatives using the BalancE3™ tool. The BalancE3™ tool is an ARCADIS software program used as a quantifiable method of evaluating sustainability and balance for corrective measure alternatives to determine how “green” those alternatives are. Seven sustainability metrics (energy usage, air emissions, water consumption, land impact, material consumption and

material type. Examples of materials consumed include PVC for piping and well casings. Examples of waste generated include soil cuttings generated during well drilling or soil generated during excavation. For comparison purposes, total material consumption and waste generated were quantified for each alternative and converted into cf of material.

6. Stewardship is the effect of the remedy's impacts on the short- and long-term sustainability of the surrounding community, ecosystem, and local economy. The stewardship metric was evaluated using qualitative parameters which aid in identifying and accounting for site-related stewardship activities in the following areas: renewable energy, air emissions, water usage, material and waste, land and ecosystems, the effect on local economy, stakeholder involvement and community outreach, quality of life, and innovative project management. The BalancE3 stewardship parameters were selected by extrapolating concepts in the USEPA green remediation primer and various USEPA region green remediation policies, as well as incorporating concepts being addressed at the industry level through coalition groups for green remediation (e.g., ASTM International, Interstate Technology and Regulatory Council, and the Sustainable Remediation Forum). The assessment results provide a relative ranking of stewardship on a scale of 1 to 10 for the corrective measure alternatives.

7. Health and safety considerations were evaluated for each alternative by identifying the associated inherent risks (which include risks that are associated with active remedies), risks associated with site conditions and geographic location, and also risks that are a direct result of the technical approaches within the alternatives. Hazard Assessment and Risk Control (HARC; a common evaluation process in the industry) was applied, and a hazard matrix specific to typical ARCADIS activities was developed. HARC lists more than 125 hazards, along with their respective risk, based on the likelihood of the hazard and the severity of its consequences. For comparison, each corrective measure alternative receives a score on a scale of 1 to 10, with 1 being the best score, using the above evaluation.

The result of the overall analysis is a relative comparison of the potential corrective measure alternatives developed for each area (Area 1 or Area 2). A summary of the sustainability assessment results for the selected metrics is included in Table 8-1.

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Appendix F. Costing Summary Sheets
Former Lockheed Martin French Road Facility, Utica, New York.
Table of Contents

	Page No
Monitored Natural Attenuation Portion For Area 1 and 2	2
Institutional Controls Portion For Area 1 and 2	3
Continued Operation of the Existing Groundwater Collection and Treatment System Portion For Area 1 and 2	4
Alternative 1-3 - Extension of the Groundwater Collection and Treatment System Portion	5
Excavation Pre-Design Activities	6
Alternative 2-3 -Focused Excavation Portion	7
Alternative 2-4 - Complete Excavation Portion	8

Appendix F. Costing Summary Sheets
Institutional Controls Portion For Area 1 and 2
Former Lockheed Martin French Road Facility, Utica, New York.

Assumptions

Frequency 4 times per year
Operation cost were divided between Area 1 and Area 2

Annual O&M Costs

Direct Annual Costs	$4,100	Mob costs, labor, equipment
Indirect Annual Costs	$1,100	Quarterly updates, administrative charges
Total O&M Costs	$5,200	4 inspections per year

Total O&M Cost for Area 1	$2,600
Total O&M Cost for Area 2	$2,600

All costs are based on an accuracy of +50/-30% (USEPA, 2000)

Appendix F. Costing Summary Sheets
Continued Operation of the Existing Groundwater Collection and Treatment System Portion For Area 1 and 2
Former Lockheed Martin French Road Facility, Utica, New York.

Assumptions

Cost based on current cost for operation of Manhole 1.
Operation cost were divided between Area 1 and Area 2

O&M Costs

Direct Annual Operating Costs	$50,200	Include system operation and reconditioning of equipment
Contingency Costs	$10,000	20% of direct costs
Indirect Annual Operating Costs	$5,000	Additional administrative charges
Total O&M Costs	$65,200	

Total O&M Cost for Area 1	$32,600	
Total O&M Cost for Area 2	$32,600	Years 1 through 10 (Year 10+ all cost are incurred by Area 2)

Cost assumes that area is clear and accessible
Reporting costs are not included
All costs are rounded to the nearest $1000, except for values under $100,000 that were rounded to the nearest $100
All costs are based on an accuracy of +50/-30% (USEPA, 2000)

Appendix F. Costing Summary Sheets
Alternative 1-3 - Extension of the Groundwater Collection and Treatment System Portion
Former Lockheed Martin French Road Facility, Utica, New York.

Assumptions

Trench extension	130	ft
Conduit extension	645	ft for pump wiring to MH-1
Duration	6	weeks

Capital Costs

Material Construction Costs	$10,900	Includes taxes, freight and mark-up
General Costs	$9,000	Mob costs - Equipment Mob
Yard Piping and Below grade Conduit Cost	$15,800	Silt fence, excavation
Direct Labor Cost	$100,800	
Equipment Rental/Labor Cost	$129,200	
Electrical and Mechanical Installation Cost	$15,300	
Site Restoration Cost	$1,900	Asphalt/Concrete Repair
Contingency Costs	$56,500	20% of direct costs
Indirect Construction Costs	$57,500	Design, oversight costs
Total Capital Costs	$400,000	

O&M Costs

Direct Annual Operating Costs	$2,100	Additional to the operation of the current GCTS system
Indirect Annual Operating Costs	$300	Additional administrative charges
Total O&M Costs	$2,400	Additional to the operation of the current GCTS system

Total Cost for Extension of the Groundwater Collection and Treatment System Portion - Area 1

Present Value Cost	$430,000

Notes
Cost assumes that area is clear and accessible
Reporting costs are not included
All costs are rounded to the nearest $1000, except for values under $100,000 that were rounded to the nearest $100
All costs are based on an accuracy of +50/-30% (USEPA, 2000)
Present Value at 7%

Appendix E. Costing Summary Sheets
Excavation Pre-Design Activitie s
Former Lockheed Martin French Road Facility, Utica, New York.

Assumptions

Additional field investigation would be required as part of pre-design acitvities to better understand the location of area utilities, establish utiliites to be rerouted to maintain site operations, define the limits of excavation and confirm the concentrations identifed in 2010.

Focused Excavation - Pre-Design Activitie s

Additioanl Soil Sampling Locations	5	per area
Investigation Costs	$29,800	VOCs in soils
Utility Location Costs	$1,900	
Utility Relocation Costs	$15,000	
Contingency Costs	$9,400	20% of direct costs
Indirect Annual Operating Costs	$4,500	Quarterly updates, administrative charges
Total Pre-Design Costs	$61,000	

Complete Excavation - Pre-Design Activitie s

Additioanl Soil Sampling Locations	30	total
Investigation Costs	$44,400	VOCs in soils
Utility Location Costs	$3,800	
Utility Relocation Costs	$25,000	
Contingency Costs	$14,700	20% of direct costs
Indirect Annual Operating Costs	$6,700	Quarterly updates, administrative charges
Total Pre-Design Costs	$95,000	

Cost assumes that area is accessible
Reporting costs are not included
All costs are rounded to the nearest $1000, except for values under $100,000 that were rounded to the nearest $100
All costs are based on an accuracy of +50/-30% (USEPA, 2000)

Appendix F. Costing Summary Sheets
Alternative 2-3 -Focused Excavation Portio n
Former Lockheed Martin French Road Facility, Utica, New York.

Assumptions

Three Areas of Excavation

Area 1 - Near MW-1 8

CVOCs Impacted Soil Area	400	ft^2
Excavation Depth	10	ft
Percentage of Non-Hazardous Waste	90%	
Percentage of Hazardous Waste	10%	
Duration	1	weeks
Number of Post-Excavation Soil Samples	2	

Area 2 - Near A2-PZ-7/A2-PZ- 2

Bulking factor	400	ft^2
Excavation Depth	12	ft
Percentage of Non-Hazardous Waste	90%	
Percentage of Hazardous Waste	10%	
Duration	1	weeks
Number of Post-Excavation Soil Samples	2	

Area 3 - Near A2-PZ-6/A2-PZ-1

Total Excavation time	400	ft^2
Excavation Depth	15	ft
Percentage of Non-Hazardous Waste	90%	
Percentage of Hazardous Waste	10%	
Duration	1	weeks
Number of Post-Excavation Soil Samples	2	

Capital Costs

Site Preparation	$34,000	Erosion control, well abandonment
Excavation Activities	$56,000	Excavation, mob/demob, air monitoring
Excavation Shoring	$28,350	Timber trench sheeting embracing costs include: pulling and salvage.
Excavation Dewatering	$12,600	
Transportation and Off-Site Disposal	$114,000	
Restoration Activities	$26,400	
Post Excavation Sampling	$4,500	
Contingency Costs	$69,000	25% of direct costs
Indirect Costs	$61,000	Includes design, bidding, permitting, project management
Total Capital Costs	$406,000	

Notes
Cost assumes that area is clear and accessible
Reporting costs are not included
All costs are rounded to the nearest $1000, except for values under $100,000 that were rounded to the nearest $100
All costs are based on an accuracy of +50/-30% (USEPA, 2000)